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THIS JOURNAL *is non-political and seeks only to further the pursuit of knowledge. Its main purpose is to communicate to scholars abroad the results of scientific investigations of the Near East as carried out in Israel. But as fruitful work can be accomplished only by reciprocal endeavour, papers from contributors in other countries will be gladly considered. The subjects to be dealt with include the history, archaeology and culture of the countries of the Near East, as well as their geography and natural features. — The Editors are not responsible for the opinions expressed by contributors.*

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The 'War of the Sons of Light and the Sons of Darkness' and Maccabean Warfare

M. AVI-YONAH

Israel Department of Antiquities

THE following notes are intended as a preliminary technical enquiry into a possible reflection of the practice of Maccabean warfare in the 'War of the Sons of Light and the Sons of Darkness' (DSW). This scroll was acquired by the Hebrew University from the Dead Sea find; so far Prof. E. L. Sukenik has published a summary of its contents, two pages of the MS out of nineteen[1] and a correction.[2] Fuller study must, perforce, await complete publication.

The army of the 'Sons of Light' is based on a general mobilization of the people from the age of fifteen to thirty, a cavalry corps aged thirty to forty-five, 'officers' (*shotrim*) of forty to fifty, commanders aged fifty to sixty.[3] It is organized into battalions of a thousand men, companies of one hundred, platoons of fifty and sections of ten,[4] each with its own commanding officer. The battalions are called 'flags' (*degel*),[5] a reminiscence of Persian times.[6] It operates in three bodies, the phalanx ('the flags of the middle', *diglê bênayim*)[7] composed of three battalions in the centre, cavalry on the wings;[8] each of these 'orders' (*seder*)[9] having a special commander, who takes up his position (*ma'amad*) in the battle

[1] E.L. Sukenik, *Megilloth Genuzoth*, I, Jerusalem, 1948, (henceforward: *MG* I), pp. 18-21, 25,26, Pls. VIII-IX. [2] *Id.*, *Megilloth Genuzoth*, II, Jerusalem, 1950, pp. 51-2. [3] *MG* I, p. 19. [4] *Ib.*

[5] 'and the three flags of the middle shall issue from the gates', *ib.*, p. 25, ll. 3-4.

[6] Cf. the 'flags' in which the Jewish military colonists were organized at Elephantine-Yeb in the fifth century B. C. (Cowley, *Aramaic Papyri*, Oxford, 1923, pp. XVI-XVII, 12), but cf. also Num. x, 14 etc. [7] See n. 5 above. [8] 'and at their side the riders on the right and on the left', *MG* I, p. 25, ll. 4-5. [9] 'when the three orders shall be in position'. *ib.*, p. 25 l. 6.

line before the attack.[10] Slingers (*anshê ha-qela'*)[11] and javelin-throwers (*zeraqôt-ha-milhama*) precede the general attack.[12] They form the combat-line (*ma'arakha*).[13] Their skirmishing is followed up by the general attack of the phalanx.[14] Cooks, 'spoilers' and 'collectors of booty'[15] were attached to the army.

These various bodies have their own standards, each with an appropriate inscription.[16] Signalling during battle is done by trumpet calls; there are special signals for advance (*miqra'*), attack (*hallalim*, lit. 'slaying'), retreat (*mêshiv*), re-assembly (*me'assef*), pursuit (*meradef*) and ambush (*me'arêv*).[17] Before the attack the whole army with the trumpets give a 'great shout of war to strike terror into the heart of the enemy'.[18] The head-priest (*kohen-r'osh*) and the priests 'his brethren' accompany the army in the field; and it is the priests who do the signalling;[19] prayers precede and follow the battle.[20]

The whole proceedings are highly formalized and the various operations follow each other like the movements of a ballet: the slingers throw seven times and retreat upon the first line and the javelin-throwers throw seven times and than retreat etc.[21] The distribution of military duties by ages as described above is entirely unpractical and the set ritual before battle at least doubtful.[22]

In spite of its obvious character as a military allegory, it is nevertheless clear that the writer modelled his ideal warfare on the actual practice of his times, and once had the occasion actually to observe it or at least to learn about it from eye-witnesses. Of course there are many analogies with Biblical accounts of battle: the division into thousands, hundreds, fifties and tens;[23] the 'officers'[24] (i.e., military police), the organisation in three 'heads',[25] the trumpeting and the shouting.[26] These, however, are either common to all ancient warfare or elements deliberately taken over by the Maccabees as part of the national military tradition.

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[10] 'and the chiefs shall disperse to their "orders", everyone to his position' *ib.*, l. 6. The word *ma'amad* occurs also in *DSD* II, 23 to indicate 'status'.

[11] 'the trumpets shall sound... to the slingers till they shall have thrown seven times' *ib.*, ll. 1-2.

[12] 'the javelin-throwers shall come forward...: and they shall throw seven times against the enemy's line' *ib.*, ll. 10-13.

[13] The 'first line' is mentioned *ib.* ll. 2-3; the no-man's land 'between the lines', *ib.*, l. 4.

[14] 'The priests shall signal to the three flags', *ib.*, ll. 14-15. [15] *MG* I, p. 19.

[16] *Ib.* The fact that different 'inscriptions' are used when marching out, attacking and returning suggests rather that by *'otot* the author means (written) signs and counter-signs.

[17] *Ib.*, and p. 25, ll. 2,3,8,9,13. [18] *Ib.*, l. 10. [19] *Ib.*, p. 26, l. 4; p. 25, ll. 2,5 etc.

[20] *Ib.*, p. 26, passim. [21] *Ib.*, p. 25, ll. 1-2, 13. [22] The more realistic Book of Maccabees attributes a different prayer to Judas before each fight, rather in the nature of the address to the army usual in antiquity; see note 34 below. [23] Exodus xviii, 21; Deut. i, 15. [24] Deut. *ib.*, and xx, 5, 8; Jos. i. 10; iii, 2. [25] Jud. vii, 16; ix, 43; I Sam. xi, 11. [26] Num. x, 9 etc.

Thus when Judas Maccabaeus organized his army at Mizpa, he followed, according to Josephus[27] 'the ancient customs of their forefathers' and set up groups of thousands, hundreds etc.[28] But he equally followed the common Hellenistic practice,[29] which indeed is not very different from that observed to this day. The 'officers' of the Bible were paralleled by similar functionaries in the Maccabean army; the same Greek term ('scribe', γραμματεύς) is used to describe them by the LXX Joshua iii, 2, etc. and in I Maccabees v, 42.

There is other and clearer evidence that Hellenistic warfare influenced the writer. The division of the army into an infantry phalanx with cavalry on the wings and slingers etc. in front is standard Hellenistic tactics.[30]

The parallels with the Maccabean wars are much closer than that: thus the standard division of their standing army into three bodies of a thousand, commanded respectively by the brothers Judas, Simeon and Jonathan,[31] recalls the three 'flags of the middle' of our text. The use of trumpets as a signal for attack[32] or pursuit[33] as well as prayers 'shouted' before battle 'in the language of the forefathers'[34] were the normal practice. Priests fought with the army; many fell at Marissa who wanted ill-advisedly (ἀβουλεύτως) to show their prowess.[35] The Jewish phalanx (ὁ λαός 'the people') proved its worth in the fight at Iamnia, withstanding the attacks of the Seleucid cavalry for a whole day.[36] Battle-cries like 'With the help of God' (Θεοῦ βοηθείᾳ) or 'Victory from God' (Θεοῦ νίκῃ)[37] recall the longer and more elaborate inscriptions on the standards of the 'Sons of Light'.

One can find in the Maccabean wars a parallel for each of the operations

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[27] *Antiquities,* XII, 301. [28] I Macc. iii, 55.

[29] Abel, F. M.: *Les livres des Maccabées,* Paris, 1949, *ad loc.* Indeed the community was itself organized in this way, *D S D,* II, ll. 21-23. [30] E. g. Bacchides at Eleasa, I Macc. ix, 11.

[31] Cf. e. g. I Macc. v, 17. Each battalion of 1000 had a (reserve) body of 2000 attached to it. At Emmaus the 'selected men' fought, numbering 3000 (I Macc. iv, 6). Later on Simon took one whole regiment to Galilee, Judas and Jonathan the two others to Gilead. There was a fourth body, the general levy (commanded by Joseph b. Zacharia and Azaria), about 6000 strong. The 3000 men who stayed with Judas in his last battle (I Macc. ix, 5) are his personal battalion; of these only 800 remained when the battle began (*ib.,* 6), being the effective strength of his own *degel.* The whole subject of the recruiting, strength, and organization of the Hasmonean army will be discussed in detail elsewhere,

[32] The Jews blew trumpets as their enemies left the camp at Emmaus (I Macc. iv, 6); again at Diathema (*ib.* v, 33); before the battle of Eleasa both parties blew their trumpets (*ib.* ix, 13).

[33] After the defeat of Nicanor's army 'the signal-trumpets' were sounded (I. Macc. vii, 45) to call out the villagers for a pursuit. [34] I Macc. v, 33 (before Diathema); II Macc. xii, 37 (in battle against Gorgias). Cf. also I Macc. iii, 18-22; iv, 8-11, 30-33 etc. [35] I Macc. v, 67.

[36] *Ib.,* x, 81. [37] II Macc. viii, 23; xiii, 15.

ordered by the trumpet-signals of our text: the advance at Emmaus:[38] the attack at Eleasa;[39] the retreat at Beth Zecharia;[40] the re-assembly at Gezer;[41] the pursuit of Nicanor's army[42] and the ambush at Beth Horon.[43]

As usual, however, it is the exceptions from the common military practice of the age that give us the most valuable indications. Our text gives at least two of these:

(a) The peculiar prominence given to the 'spoilers' and 'collectors of booty' in the army of the 'Sons of Light'. Several passages in the Book of Maccabees stress the great importance of captured arms for the almost weaponless Jewish rebels. Thus at the very beginning of the revolt Judas slays the enemy leader Apollonius and takes his sword 'which he carried for the rest of his life'.[44] Before the battle of Emmaus the Jews had no proper armour, but only some bad swords.[45] The capture of arms from Lysias are specially mentioned among the bad news received by Antiochus in Persia.[46] According to Josephus, Apollonius challenged Jonathan to a fight 'not with stones, but with arms'.[47] Indeed Jonathan had only lately received official permission to arm his troops[48] and only under Simon do they appear well-armed.[49] The prominent place accorded to the collection of booty is thus peculiar to the Maccabean practice, which differs in this point from all Hellenistic regular warfare.

(b) The fact that a special signal is made for ambush, may be taken to point in the same direction. Ambushes are the common practice of every guerilla war, the Maccabean revolt included.[50] Their inclusion here is the more striking if we remember that the warfare described is an open battle of the most formal kind.

Having thus gained a *terminus a quo,* we should give also some consideration to a *terminus ad quem,* i. e., look for possible indication of practices derived from the Romans. So far we could discover no positive indication, and two rather negative ones. Firstly, the javelin throwers and the phalanx attack separately;[51] whereas it is well known that the Roman legionary first threw his *pilum* and then drew his sword and fell upon the enemy, combining thus both functions. Secondly, the regular troops fight with their spears only, as did the Greek phalanx; when the signal is given 'they put their hands to their weapons'[52] (as

[38] I Macc. iv, 13-14. [39] *Ib.*, ix, 13. [40] *Ib.*, vi, 47. [41] *Ib.*, iv, 16-18. [42] *Ib.*, vii, 45.
[43] *Ib.*, iii, 23. [44] *Ib.*, iii, 12. [45] *Ib.*, iv, 6. [46] *Ib.*, vi, 6. [47] Josephus, *Antiquities*, XIII, 90.
[48] I Macc. X, 21 [49] *Ib.*, xiv, 9, 32. [50] *Ib.*, iii, 12; ix, 38; II Macc. viii, 6; xiii, 15.
[51] *MG* I, p. 25, ll. 12, 14. [52] *Ib.*, l. 8.

is done with spears) instead of taking the weapons in their hands, as they would do if the text implied swords.

Various details mentioned in Sukenik's summary seem to support a Late Maccabean, but pre-Roman dating. Thus the 'Sons of Light' consist of the sons of Levi, Judah and Benjamin. The prominence given to Levi, i.e., the priestly tribe, from which sprang the house of Mattathias, is evident.[53] The list of the enemies, the 'Sons of Darkness', closely parallels the list of the enemies of the Maccabees: 'the armies of the Khittim of Assyria' (the Seleucid army), the Edomites,[54] Moabites[55] and Ammonites.[56] The armies of Gorgias have their base in Philistia and retreat there;[57] and '*Pleshet*' duly appears amongst the 'Sons of Darkness.' The argument derived from the designation of the high-priest as 'head-priest' (*kohen r'osh*) instead of 'great-priest' (*kohen gadol*) as on the Maccabean coins is of no value if we accept the view that no coins were issued before Hyrcanos I.[58]

If we try to narrow down the dating there are several indications seeming to point to the time of Jonathan: the possibility of a contact between the sectaries and the Hasmonean army under the command of Jonathan during its sojourn in the Judaean Desert;[59] the description of the apocalyptic war as a series of successes followed by reverse and then by a recovery, which resembles the general outline of events from the beginning of the revolt to the time of Jonathan. There are two other chronological pointers to the later part of his rule (after 152 B.C.): the fact that the army is led by a high priest, and the existence of a Jewish phalanx, which first appears in our sources fighting at Iamnia. Yet there is no mention of the mercenary troops of the later Hasmonaeans.[60]

To sum up: the military reality behind the Messianic allegory called 'War of the Sons of Light and the Sons of Darkness' are reminiscences of Maccabean warfare, embroidered by the author's Messianic fancy and sectarian predilections.

As already stated, all our conclusions are of necessity provisional; as soon as the eagerly awaited publication of the whole scroll shall be in our hands a further study on similar lines might bring more certain results.

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[53] *Ib.*, p. 19; cf. the 'Testaments of the XII Patriarchs' as regards the prominence accorded to Levi.
[54] I Macc. v, 3; II Macc. x, 17.
[55] I Macc. v, 4-5: 'the Sons of Baean' in Moab. [56] *Ib.*, 6.
[57] εἰς γῆν ἀλλοφύλων—the usual designation of the Philistines, I Macc. iv, 22; v, 66.
[58] Kanael, B.: The beginning of Maccabean Coinage. *Israel Explor. Journ.*, I, 1950-1, pp. 170-175.—I wish to thank Mr. Kanael for some corrections in this paper. [59] I Macc. ix, 33.
[60] Josephus, *Antiquities*, XII, 249; XIII, 374, 377 etc.

Frederic Hasselquist in Palestine, 1751

F. S. BODENHEIMER

Hebrew University, Jerusalem

In 1747, Frederic Hasselquist entered the study of his teacher, Carolus Linnaeus, to announce his decision to go to the Holy Land and explore its natural history. This devoted pupil, a poor phthisic orphan of a curate, was born in Östergothland in 1722. That summer of 1747 he had listened to Linnaeus lecturing to a few advanced students in Uppsala on *Fundamenta Botanica.* In one of his lectures Linnaeus had summed up the actual knowledge of the various regions in the world, complaining that the natural history of the Holy Land was as little known as that of the remotest provinces of India. He had added that the first explorer there would earn great and eternal fame, if only for the authentic interpretation of certain references in the Scriptures.

When Hasselquist came to him, Linnaeus warned of the 'length of the way, the great difficulties, the many dangers, the very considerable expenses which would attend such an undertaking and, lastly, his indifferent state of health, in particular his weak lungs, as he was subject to the spitting of blood; but he (Hasselquist) urged it the more, as weak lungs can only be cured by travelling and change of climate and was determined enough in his resolution to say, he would rather walk all the way, than have his purposes crossed'.*

Hasselquist continued with his studies in Uppsala, passing in April 1749 his examination for the degree of Licentiate of Medicine. Linnaeus was then able to procure for him a few Royal stipendia from Uppsala University and a free passage to Smyrna on board the *Ulrica,* a ship belonging to the Swedish Levant Company. The main stages in his journey were:

7.8.-27.11.1749	From Stockholm to Smyrna.
Until early April 1750	First stay in Smyrna, with an excursion to Magnesia.
15.-30.5.1750	Alexandria.

* *Frederic Hasselquists Iter Palaestinum eller Resa til Heliga Landet forrattad ifran Ar 1749 til 1752...* pa Hennes Kongl. Maj:ts befallning utgifven af Carl Linnaeus. Stockholm, 1757. German: Rostock, 1762. French: Paris, 1769. Dutch: Amsterdam, 1771. English: London, 1776.

11.6.1750-13.3.1751	Stay at Cairo, with excursions to the Pyramids and to Sakkarah.
13.-28.3.1751	To and at Damietta.
1.4.1751	Landing at Jaffa.
4.4.-21.4.1751	Stay in Jerusalem, with excursions to Jericho, the Dead Sea and Bethlehem.
21.4.-13.5.1751	From Jerusalem via Ramle to Acre. From there to Tiberias, Nazareth, Mt. Tabor, Safed, Kana, and back to Acre.
14.5.1751.	Saida.
23.5.-28.6.1751	Cyprus.

First half of July 1751 to Rhodos, Stanchio, and Smyrna.
He remained in Smyrna till he died the following year, in February 1752.

His manuscripts reached Sweden two years later where they were incorporated into the museum of Queen Ludovica Ulrica at Drottningholm. They were edited by Linnaeus as *Iter Palaestinum.* Today Hasselquist is almost forgotten; his life, his voyage, and his works are little known. A biography is about to appear at the bicentenary of his death, written by the present author. In this article it is intended to outline briefly a few facts and observations of his weeks in Palestine.

Hasselquist was undoubtedly one of the first travellers in Palestine who, whilst not neglecting the duties of pilgrimage, fixed his mind upon observing nature, eagerly collecting all objects upon which he could lay a hand. He tells that at Jericho his herbarium served him for a pillow. 'I was happy in having this when the rest of the company had nothing to lay on but the bare earth.' (*Iter,* p. 127).

The herbarium was published in 1756 as a botanical dissertation, *praeside Linnaeo,* by Strand as *'Flora Palaestinae'*. It contains over 650 species of plants, almost all from Jerusalem, Jericho, and Jaffa. It is a most remarkable achievement for three weeks collecting during a tiresome pilgrimage with hastily proceeding caravans. This herbarium was not merely an undetermined heap of plants when it reached Sweden, for Hasselquist had already begun to identify and describe the plants as he journeyed homeward. Those he knew he noted in binary nomenclature, whilst the others he provisionally described and left for future final identification. We reproduce here his notes on Jaffa from the many florulae composed en route for his future book: (3.4.1751)

Hyoscyamus aureus. Golden Henbane. Abundant on the walls of houses near the sea.

Naturalia Palæstina

Hierosolyma
Apr. d. 7. 1751.

Aarta

Gramen Festuca ? plusquam pedale fol. linearibus mollissimis. habitat in aridis circa urbem, ovibus et capris grata pabula.

Cyperus fol. cordato-lanceolatis, filiquis longis, pendulis, pedunc. capillaribus, basi tenuioribus. Inter Segetes.

*semiamplexicaulibus

Geranium cal. 5phyllo, fol. cordato-ovatis, incisocrenatis. Juxta vias frequentissime.

Geranium fol. compositis, foliol. alternis pinnatifidis. Cal. 5phyllo. Cum altero commune.

Cynoglossum fol. tuberculatis, scabris, hispidis.

Asperugo fol. ovatis. in caulibus

Lamium fl. albo.

Urtica Romana.

Specimen-page from Hasselquist's Herbarium.

Parietaria officinalis. The pellitory also grows occasionally in walls.

Lycium spinosum. In the hedges, reaching the height of man: the monks say that it be the plant from which the crown of Christ was made.

Euphorbia foliis oblongis lanceolatis verticillatis, herbacea, inermis, pedalis. Grows in hedges.

Buphthalmum foliis duplicato-pinnatis. On roofs and on the roads.

Buphthalmum foliis oblongis laciniatis, laciniis denticulatis oppositis. Along the margins of the roads.

Turritis caule simpliciusculo, foliis radicalibus longis lanceolatis: terminali maxima dentata. On the sand.

Cnicus tomentosus, foliis cordalis amplexicaulibus dentatis integris. Dentes calycis basi maxime tomentosi.

Papaver Rhoeas. Common amongst thistles. The poppy.

Malva vulgaris. The mallow grows along the margins of the roads. In the gardens.

Ficus carica. The fig-tree, with equally divided branches, shady green leaves and abundant fruit.

Rosa damascena. In beautiful specimens.

Terebinthus, common.

Sycomorus, recently fruiting, without its insect.

Citrus aurantia, abundantly flowering. (This is one of the earliest references to the orange groves of Jaffa).

Amygdalus persica. The peach-tree.

Cannabis vulgaris. A few specimens of hemp grown in a garden only used by the Mohammedans: they powder the leaves and make a narcotic from them which has the same effect as opium. The confection is called Chaschis, and is much used in Egypt.

Hasselquist was the first botanist to collect important materials for a Flora Palaestinae, apart from Rauwolf who presented a few Palestinian plants in his herbarium two hundred years before. Nor was he followed in this respect for another hundred years.

We learn from the correspondence of Linnaeus, that a very great collection of soils, minerals, stones and fossils 'from almost every mountain of the Holy Land' was found in Hasselquist's collections. He has written little about them in his notes, obviously leaving the working out of these materials for his return to Sweden. They have apparently been lost, as only a few materials from the

Dead Sea mentioned in the *Iter* (p. 284 f.) could be found in the collections of the Mineralogical Institute at Uppsala.

His description of the hot springs of Tiberias is of interest to us (*Iter* p. 238 f.):

(1) The fountain or source is at the foot of a mountain, at the distance of a pistol-shot from Lake Gennezareth, and a quarter of a mile from the beach of Tiberias.

(2) The mountain consists of a black and brittle sulphureous stone, which is only to be found in large masses near Tiberias; but in loose stones also on the shores of the Dead Sea, as well as here near Lake Gennezareth. They cut mill-stones out of it in this place, which are sent by water from Acco to Egypt. I saw an incredible quantity of them at Damietta.

(3) The spring which comes from the mountain, is in diameter equal to that of a man's arm, and there is only one.

(4) The water is so hot, that the hand may be put into it without scalding, but it cannot be kept there long; consequently it is not boiling hot, but the next degree to it.

(5) It has a strong sulphureous smell.

(6) It tastes bitter, and somewhat like common salt.

(7) The sediment deposited by the water is black, as thick as paste, smells strongly of sulphur, and is covered by two skins or cuticles, of which that beneath is of a fine dark green colour, and the uppermost of a light rusty colour; at the mouth of the outlet, where the water formed little cascades over the stones, the first mentioned cuticle alone was found, and so much resembled a conferva, that one might easily have taken this, that belongs to the mineral kingdom, for a vegetable production; but nearer the river, where the water stood still, one might see both skins, the yellow uppermost, and under it the green. There was a miserable house with seats for bathing, built close by it; but it was not kept in repair, as nobody here makes any use of these gifts of nature.'

His preoccupations with plants and minerals left Hasselquist little time during his stay in Palestine to collect animals and to prepare them properly, with the exception of the '*Sparus galilaeus*' fish from Lake Galilee (*Tilapia galilaea*), which also was carefully described (*Iter*, p. 224). On his way from Jaffa to Ramle he saw more mole-hills (read: mole-rat) than anywhere before in his life (*Iter*, p. 120), and he also saw plenty of cranes which inhabit uncultivated regions. In his notes on Jaffa, we find him describing 'the animals of the place' (*animalia loci*):

Canis species, Schiakal in Turkish, common in the Levant and in Egypt, but most so in Palestine. I saw many of its caves and holes in the hedges round the gardens. It is fatal to the herds and flocks of the Arabs, and hence always hunted. They often throw many of them into the sea. This is beyond doubt the fox of Simson.

Mustela species abounds in Palestine, especially during the vintage and often destroys whole vineyards and cucumber fields. (Apparently a mixture of reports on the jackal and the mongoose).

Scarabaeus clypeo pedicis anticis dentatis, on which plenty of small acari were found. (The scarabaeus with the *Gamasus*-mite).

Chrysomela coccinea, elytris thorace medio capiteque nigrescentibus.'

Near Nazareth he observes many Cynipid galls on the oak trees (p. 153) and describes the native bee-hives of 'Safuri' (p. 154). Riding down from Mt. Tabor he is tormented by flies and meets an Arab hunter with a falcon and fine dogs (p. 157), on whom he comments (p. 190) as follows:

'I had an excellent opportunity of seeing this sport near Nazareth. An Arab, mounting a swift courser, held a falcon on his hand; when he espied the gazelle, on the top of a mountain, he let loose the falcon, which flew in a direct line, like an arrow, and attacked the animal, fixing the talons of one of his feet into the cheek of the animal, and the talons of the other into its throat, extending his wings obliquely over the animal; spreading one towards one of its ears, and the other to the opposite hip. The animal, thus attacked, made a leap twice the height of a man, and freed itself from the falcon; but, being wounded, and losing its strength and speed, it was again attacked by the falcon, which fixed the talons of both its feet into the throat of the animal, and held it fast, till the hunter coming up, took it alive, and cut its throat; the falcon drinking the blood, as a reward for its labour, and a young falcon, which was learning, was likewise put to the throat of the gazelle. By this means are young falcons taught to fix their talons in the animal's throat, where is the most proper part; for should the falcon fix them in the prey's hip or elsewhere, hunter and falcon would both lose their game: the gazelle, not mortally wounded, would run to the deserts or mountain tops...'

The only bird collected in Palestine was the quail from the Jordan (p. 203). Mention is made also of the hardoun (p. 219).

Hasselquist (*Iter,* p. 290 ff.) gives the following list of animals which he saw in the Holy Land:

Mammals

1. Hystrix cristata (*Hystrix leucura schmitzi* Muell.) On the Mountain of Temptation near the Jordan River.
2. Canis aureus (*Canis aureus* L.), chical in Turkish. Near Jaffa in the fields.
3. Canis vulpes vulgaris (*Vulpes vulpes palaestina* Thos.). Near Bethlehem and in Philistaea, abundant in vineyards.
4. Capra gazella africana (*Gazella gazella* L.). On Mt. Tabor.
5. Cervus dama (*Dama dama mesopotamica* Br.). On Mt. Tabor.

Birds

6. Falco percnopterus (*Neophron percnopterus* L.). Around Jerusalem.
7. Falco venatorius (*Falco cherrug,* probably). With the Bedawi.
8. Falco tinnunculus (*Falco tinnunculus tinnunculus* L.). On the rocks near Nazareth.
9. A vulture (*Neophron percnopterus percnopterus* L.). Seen near Cana in Galilee.
10. Monedula caerulea (*Coracias garrula semenowi* L. et T.). Abundant in the oak forests of Galilee.
11. Picus viridis (*Dryobates syriacus* H. et E.). In the oak forests of Galilee.
12. Merops apiaster (*Merops apiaster* L.). In the woods and fields between Acco and Nazareth.
13. Motacilla luscinia (*Luscinia luscinia* L.). In the willows along the Jordan and in the olive groves of Judaea.
14. Alauda campestris (*Anthus campestris campestris* L.). Everywhere.
15. Carduelis (*Carduelis carduelis niediecki* Reich.). In the gardens near Nazareth.
16. Tetrao perdix rufa (*Ammoperdix heyi heyi* Temm.) and
17. Tetrao israelitarum (*Coturnix, Pterocles?*). In the deserts around the Dead Sea.
18. Tetrao coturnix (*Coturnix coturnix coturnix* L.). In Galilee.
19. Columba turtur (*Streptopelia turtur turtur* L.). Grey, with black collar.
20. Columba palumbus (*Columba palumbus* L.). In Galilee.

Hasselquist devoted a special chapter in the *Iter* to the natural history of the Scriptures, where along with correct identifications of the Christ's thorn as *Zizyphus spina-christi* or of the Sodom's apple as *Solanum sanctum,* a few less happy guesses are made. He leaves in doubt, whether the *zlav* of the Bible is the quail or the sandgrouse; the actual absence of the lion leads him to doubt its historical presence in Palestine; the locusts eaten by St. John lead him to comprehensive enquiries about the locusts eaten in his own time in Arabia (*Iter,* pp. 291 ff., 442 ff.), etc. In the *Materia medica* we find a note, that the best scammony comes from Marash, but that formerly it had come from Mt. Carmel from where it was shipped to Europe via Acre. He saw this plant grow wild near Nazareth, where the inhabitants were neglecting to gather it, 'being more addicted to plunder than labour' (*Iter,* p. 299 f.).

Nor will the archaeologist and historian be disappointed in reading the *Iter.* Amongst many other details we read about the Jews of Jerusalem (p. 124):

'Jerusalem has amongst its inhabitants about 20.000 Jews. The Jew women go here with their faces uncovered; this the Turks have ordered, that they may be known from

their own women. The greatest part of the Jews here are poor, as they have no opportunity for commerce, and without it they cannot thrive in any part of the world. They have no other income than what they can get from the pilgrims of their nation, who come far and wide from all places to pay their respect to the seat of their forefathers. Their Rabbi has large revenues from his brethren throughout the whole world, of which the Turks draw the greatest part; for Jews as well as Christians must constantly bring offerings to their altars, if they will kiss their holy places in peace.'

As a curiosity we present here the bill for Hasselquist's three weeks of pilgrimage, presented to him by the Father Vicarius of the Latin church of the Holy Land. This bill runs to 148 piasters, which at that time had a value of about 18 £. St. The title Grogadar, mentioned in the bill, is unknown to our local experts.

Expenses and road taxes for the Swedish Gentleman and his Servant.

	piasters paras
Landing and landing tax in the port of Jaffa	22.—
Do. for the servant	11.—
From Jaffa to Ramle (Gentleman and servant)	.36
To the Governor of Ramle for both 3.12; to Bedawis and Fellahs 2.20. Total	5.32
To the beduins for company to the Holy City, and barley	17.10
Road tax for both to beduins and fellahs	1.6
Entrance into the Holy City, to the Grogadar (an official) and the Kadi	.15
Entrance into the Holy City to the Governor for the Swede and his servant	4.4
Entrance to the Holy (...?) for the Gentleman	1.20
For the asses from Ramle to the Holy City	4.20
Return from the Holy City to Jaffa: road tax, company and asses	21.4
Entrance to the Most Holy Sepulcre for the Gentleman	15.14
Entrance to the Most Holy Sepulcre for the servant	6.20
Road tax to the Jordan for the Gentleman	10.4
Do. for the servant	4.24
Trip to Bethany, Ton. sign. laetori (?), Mt. of Olives, the Tombs of the Kings. For horses and for the Grogadar	8.10
To the first dragoman 2.30, to the second dragoman 1.—	3.30
Jerusalem, the 20th of April, 1751.	138.9
Fr. Narciso de S. Ant. *Vicary of the Holy Land*	
For two horses to the Jordan, and from the Jordan to the Dead Sea	9.10
	147.19

It is hoped that the foregoing paragraphs have convinced the reader of Hasselquist's importance as the first modern naturalist in the Holy Land. A man who, despite ill health, was able during his brief visit to devote his interests to observing nature and collecting its objects in preparation for a comprehensive natural history of the country, the completion of his works being prevented by his untimely death. Surely he little deserves the complete oblivion into which he has fallen. The bicentenary of his death is an appropriate occasion to render him due honour and to restore him to his deserved place in the history of the exploration of the Levant.

The Abu Usba Cave
(Mount Carmel)

M. STEKELIS and G. HAAS

Hebrew University, Jerusalem

1. INTRODUCTION

In May, 1941, during a general examination of caves in the Mount Carmel area, M. Stekelis made a trial sounding inside the entrance of the cave called Abu Usba. Finding a layer of pottery fragments with flints of Natufian affinities, he concluded that a systematic excavation would be worth while; for, if it could be established that the pottery and flints occurred together in an undisturbed layer, Abu Usba might well prove of importance in understanding the Mesolithic—Neolithic cultural sequence in Palestine. Work was therefore begun, thanks to a grant from the American School of Oriental Research, the British School of Egyptian Archeology in Jerusalem, and the Hebrew University. To all these institutions the authors wish to express their sincere thanks.

The excavations were carried out by M. Stekelis from 15 May till 25 July, 1941, in which time one chamber of the cave was excavated and trial pits were sunk in Chamber III and on the terrace. The palaeontological fragments of the Levalloiso-Mousterian layer were sent to the British Museum of Natural History for identification, but were subsequently lost through some wartime mishap. The palaeontological remains of layer B were submitted for examination to G. Haas who presents his report in part 3 of this paper.

2. ARCHAEOLOGY OF THE ABU USBA CAVE — BY M. STEKELIS

A. Description:

Cave (or Mugharet) Abu Usba lies on the northern face of a bluff above the mouth of Wadi Falah. This wadi is one of several debouching onto the Israel Coastal plain from the western flank of the Carmel Ridge, with many caves in their dolomite outcrops. 10 kms. south along the ridge from Wadi Falah, lies Wadi Mughara, similarly containing within its cliffs caves with prehistoric remains (fig. 1).

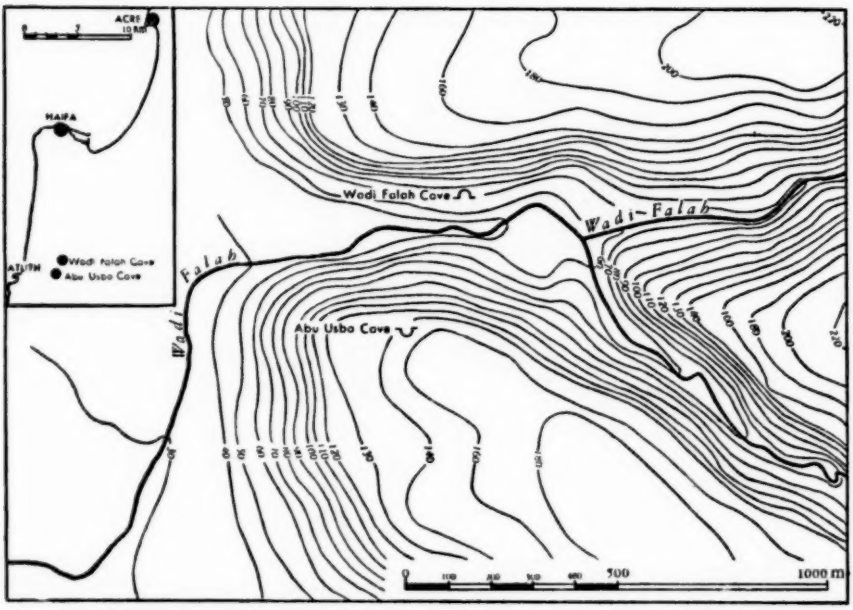
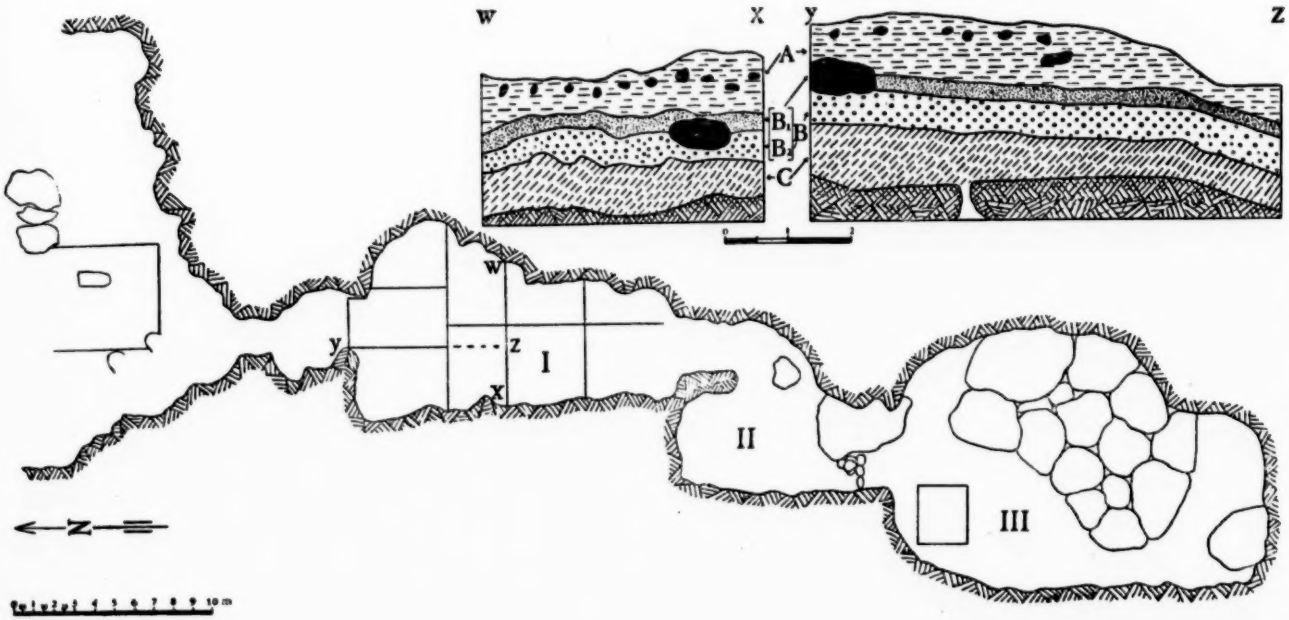


Fig. 1. Wadi Falah, showing position of the cave. *(Drawn by Z. Efron)*

The cave Abu Usba lies high up in a bluff, difficult of access, 111 m. above the wadi floor and 140 m. above sea level: it looks out towards the north-west, commanding a wide view of the coastal plain. The cave is a dark, wet place, inhabited by mosquitos and bats.

The small elliptical cave-mouth is 3 m. wide and 6 m. high. An entrance corridor, 6 m. × 4 m., leads into the first chamber (see fig. 2). This chamber measures 15 m. × 9 m. 50, and about 7 m. high. A second chamber is 8 m. 50 long and 7 m. wide, and in its northern wall contains a large natural apse. In the eastern corner of this second chamber, a mass of boulders has fallen from the cave-roof. There follows a third and innermost chamber measuring 20 m. × 13 m. This last has a lofty dome-like roof culminating in a chimney 20 m. high, which leads to the outside but is blocked with stones. At the southern end of the third chamber is a blocked passage, probably a second chimney. The talus in front of the cave, with a radius of 18 m., slopes steeply for a distance of about 12 m. This terrace was enclosed by a modern, dry-stone wall.

During the course of the excavations, it became apparent that Chamber I, lit by daylight, was the inhabited portion of the cave. The occupied portion of the



(Drawn by Z. Efron)

Fig. 2. Ground plan and sections of the cave.

second chamber was insignificant while the third, being completely dark and wet, was unsuitable for human dwelling, although the trial pit yielded a poor Levalloiso-Mousterian industry. The terrace deposit was mixed and disturbed. Work was therefore concentrated on Chamber I.

Chamber I: The excavation was carried on with small picks, shovels and brushes. No more than 5 cm. of deposit were touched at one time. Loosened dirt was first searched with the fingers, then passed through a sieve in order to lose neither microliths nor microfauna.

The first chamber was divided into 8 areas which were in turn divided into 1 m. squares. Every square was separately excavated at least to the base of layer C. Both transverse and longitudinal sections were obtained (fig. 2). In every case the sections showed a uniform sequence, as follows:

Chamber I:	A.		0.—0.90 m.	Black earth with modern remains.
	B.	B1.	0.90—1.15m.	Soft red-brown cave-earth with flint implements and potsherds. Fauna.
		B2.	1.15—1.65m.	Compact red-brown cave-earth, with potsherds and flints as above. Fauna.
				Usbian
	C.		1.65—2.35m.	Stalactite crust. Hard breccia, with animal bones and flint implements of Levalloiso-Mousterian traditions.
	D.		2.35m.	Rock.

Because of the homogeneity of their stratigraphy, there is no doubt that layers B1 and B2 belong to undisturbed deposits. Moreover, the flint and faunal deposits of layers B1 and B2 are so similar that it becomes apparent that the only differences lie in the character of the soil in which they are found, the earth from B2 being hard and compact, and in the greater hardness of the pottery sherds in this same layer. Evidently calcium carbonate had infiltrated into layer B2, hardening both the earth and the potsherds. I have called this process as regards the sherds 'fossilization of pottery'. In any case, for purposes of description and interpretation, layers B1 and B2 are considered one deposit, which will be termed 'Usbian'.

Chamber III: The trial pit in Chamber III (3m. × 2.50m.) contained the following stratification:

A.	0—1.50m.	Black soft earth with many stones. Sterile.
B.	1.50—2.00m.	Hardened black earth with limestone fragments. Sterile.

C. 2.00—3.40m. Dark brown hardened cave-earth. Levalloiso-Mousterian implements.
D. 3.40—3.60m. Soft dark brown earth. Sterile.
E. 3.60—5m. Dark brown hardened earth with decomposed fragments of limestone. Sterile.
F. 5m.—6m. Decomposed rock.
G. 6m. Bed-rock.

The Terrace: The trench on the terrace measured 5m. × 5.25m. and reached a depth of 1.20 m. The dark brown earth contained large quantities of angular limestone fragments, many rolled flint nodules, fragments of Roman-Byzantine pottery, flint implements of Upper Natufian and Mousterian types and pot-sherds similar to those of layer B in Chamber I.

Raw material, patina: The flint nodules were evidently picked up from the wadi-bed and brought to the terrace by man: no doubt they formed the raw material from which the inhabitants of the cave made their flint implements.

The flint implements found in the talus of the cave and on the slopes of the hill were washed from their original deposit, and all were covered with a creamy patina. This is in direct contrast to the flints unearthed in the cave deposit, which were markedly without patination.

Technique: The flint implements were made by striking with a wooden or bone mallet; the bulb of percussion is small and smooth. The finished tools were trimmed on the edges, some with a flat, nibbling or pressure retouche. There is no trace of polishing on any of the flints. This invention was still unknown to the inhabitants of Abu Usba.

Upper Levalloiso-Mousterian: The industry of layer C resembles the Upper Levalloiso-Mousterian of the caves el-Wad (layer G), and et-Tabun (layer B), of Mount Carmel, and ez-Zuttiyeh (Galilee); there is no doubt that it belongs to the Levalloiso-Mousterian tradition, and it does not call for any special comment.

Inventory:

Layer C, Chamber I:

Points (triangular) without retouche	50
Points (triangular) with retouche	21
Racloirs	18
Levallois flakes	21
Cores	80
Flakes, various	101
Total	291

Layer C, Chamber III:

Points (triangular) without retouche	8
Racloirs	2
Cores	11
Flakes, various	30
Total	51

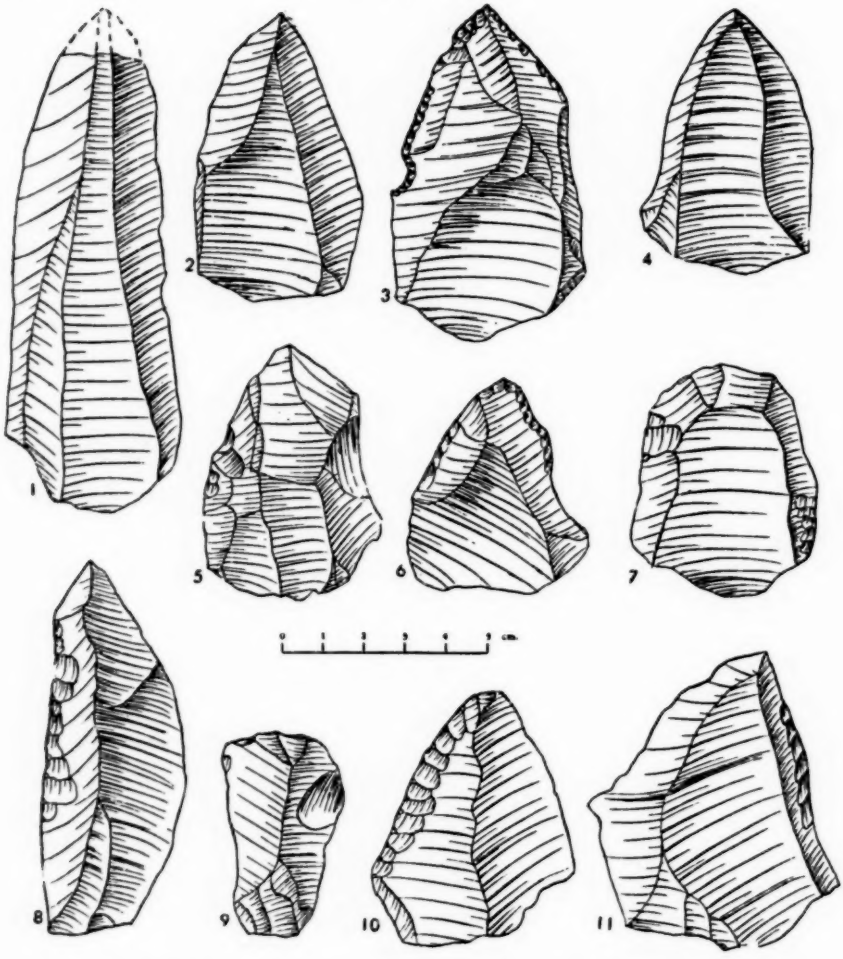


Fig. 3. Implements from Abu Usba. Layer C, Lower Levalloiso-Mousterian.

Points. The majority of the points are triangular Levallois flakes without retouche and with prepared striking platform ('end-bulb' or 'side-bulb' types). A small group have a flat retouche on one or both edges; one point of this group (fig. 3, No. 3) has a finely worked notch on its left edge.

Racloirs. Made on flakes with striking platform (majority of 'side-bulb' type); has retouche on one edge only (fig. 3, No. 8).

Cores. 15 are definitely of Levallois type (fig. 3, No. 7), the rest are atypical.

Various flakes. This group includes irregular flakes, primary flakes with cortex and flake fragments; some of them have been used as cutting implements.

Fauna. The animal bones from this layer were lost *en route* to the British Museum of Natural History.

Inventory: Layer B, Chamber I, Usbian

Intermediate tools:

Flakes (retaining crust)	31
Flakes with used edges	89
Flakes, broken-butt ends	40
Flakes, broken-tip ends	59
Flakes, notched	11
Blades, retouched	26
Blades with pressure retouche	9
Blades, various	38
Axes	3
Pseudo-awls	3
Cores, single platform	12
Cores, double platform	6
Cores, not classifiable	42
Core-tablets	4
Core-trimming flakes	14
Ridge-flakes with battered keel	5
Arrow-heads	9
Thin-pointed blades	45
Gravers	42
Graver spalls	15
Scrapers	40
Denticulated blades (saws)	9
Sickle-blades	9
Blades with inverse retouche	18
Flakes, not classifiable	110
Flints which bore traces of contact with fire	54
Total	743

Microlithic tools:

Flakes (retaining crust)	49
Pen-knife blades	52
Crescents, ordinary type	15
Crescents, Heluan type	18
Blunted-back blades	15
Micro-burins	15
Scrapers	12
Cores	22
Flakes, various	93
Total	291

Pottery:

Rim fragments	39
Base fragments	22
Wall fragments, incised	4
Wall fragments, painted	4
Handle fragments	4
Total	83

Bone objects:

Awls	5
Needles	4
Incised bones	3
Total	12

Shell pendant	1

Cores: The majority of the cores of layer B are of single-platform type (only six are of two-platform type) and with bi-polar direction of striking platform. The rest of the cores are not classifiable (fig. 4, Nos. 1, 3, 4).

Core-trimming flakes: 17 core-trimming flakes are recognised; 5 are flakes struck obliquely to platform, and two were struck from base to remove apex; 5 are ridge-flakes with battered keel (fig. 4, Nos. 2, 5, 6).

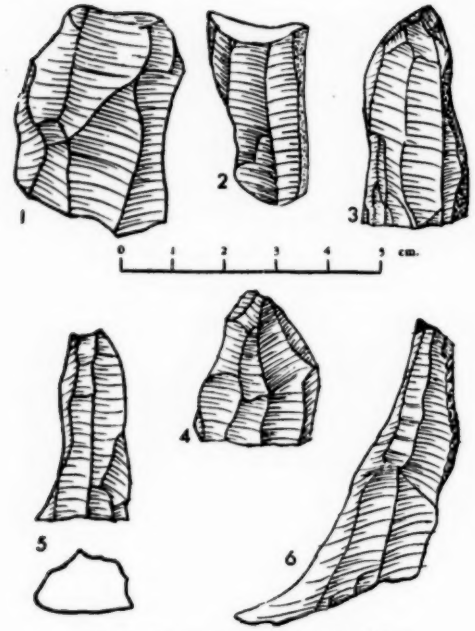


Fig. 4. Cores and core-trimming flakes.

Core-scrapers: The industry of this layer did not produce true core-scrapers. One example of the most common sort was a well-flaked conical core whose edge, though showing no signs of trimming, yet testifies to its use as a core-scraper.

Flakes: The most numerous artifacts are the flakes. Many of them, still retaining a part of the crust, were used as cutting implements; relatively few of them being retouched; many of the flakes had been broken, consisting either of tips or butt ends.

Blades: Most of the blades have secondary trimming along the edge. Some were trimmed with fine pressure or fine nibbling retouche, or with inverse retouche on the bulbar surface.

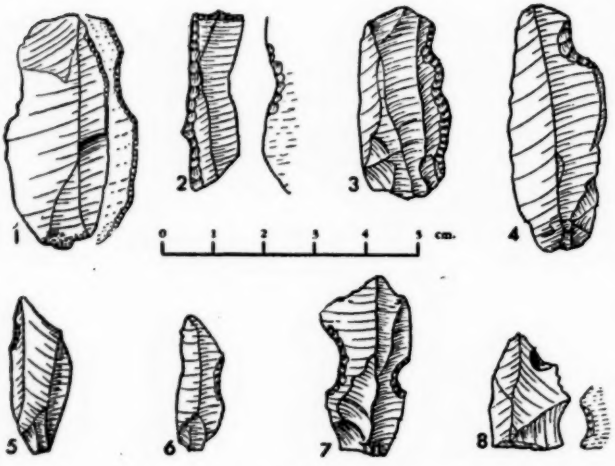


Fig. 5. Notched blades.

Notched blades: The notched blades are generally unilateral; a notch was made either on the upper face of the blade on its right side (fig. 5, Nos. 4, 6), or on its left side (No. 5), or on the bulbar surface (Nos. 1, 2, 8). No.

3 is a retouched blade with two notches on one edge, and No. 7 is an individual example with opposed notches.

Backed blades: The forms are curved or straight. The former can be classified as a variety of the 'Châtelperron' point (fig. 6, Nos. 1, 3, 4); the latter as 'Gravetted' (Nos. 6, 8.); No. 2 is an individual curved point carefully trimmed on both edges.

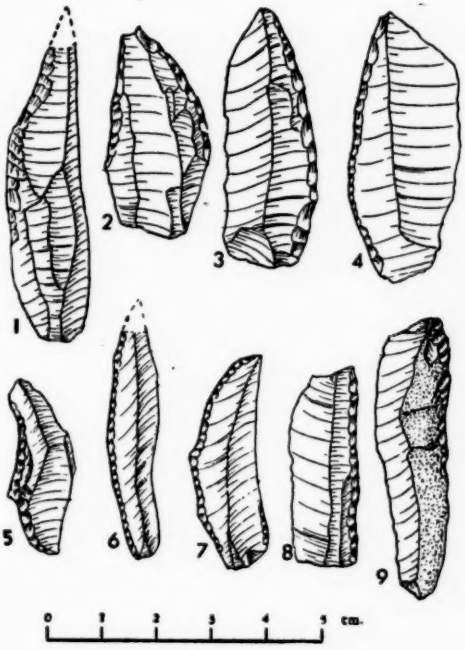


Fig. 6. Backed blades.

Gravers: The gravers include examples of the commonest types; most of them are simple-blow types; about 20 are made on obliquely or transversely truncated blades. The following types occur: fig. 7, Nos. 1, 2, 4, 5, 7, 14 are angle-gravers; No. 13 is an angle-graver showing signs of having been re-sharpened by the removal of the burin facet; Nos. 3, 8 and 15 are double-angle-gravers, while No, 15 is angle-graver at the top end and single-blow at the lower end. No. 10 is a triple-angle-graver (single-blow at the lower top); No. 9 and No. 12 are of 'burin-plan' type; No. 11 is a polyhedric and No. 16 a 'bec-de-flute'; 15 burin spalls were collected.

Scrapers: Most of the scrapers are ordinary end-scrapers made on blades or flakes (fig. 8, Nos. 1, 2, 8); two are double-end-scrapers (Nos. 3, 4); two shouldered scrapers (Nos. 7, 12); one belongs to the type *grattoir crénelé* (No. 11); one concave end-scraper (No. 6), two concave side-scrapers (Nos. 9, 10), with very fine nibbling retouche, and one of carinated type (No. 5.)

Arrow-heads (fig. 9): *(a) Primitive form.* These arrow-heads are formed on thin pointed or curved blades or flakes. No. 1 is a curved and pointed blade; a tang was produced by two opposed notches made on the bulbar surface near its base. Nos. 2, 3 and 4 are curved points on each of which a notch was produced on the upper face near the base and another notch on the opposite side on the bulbar surface.

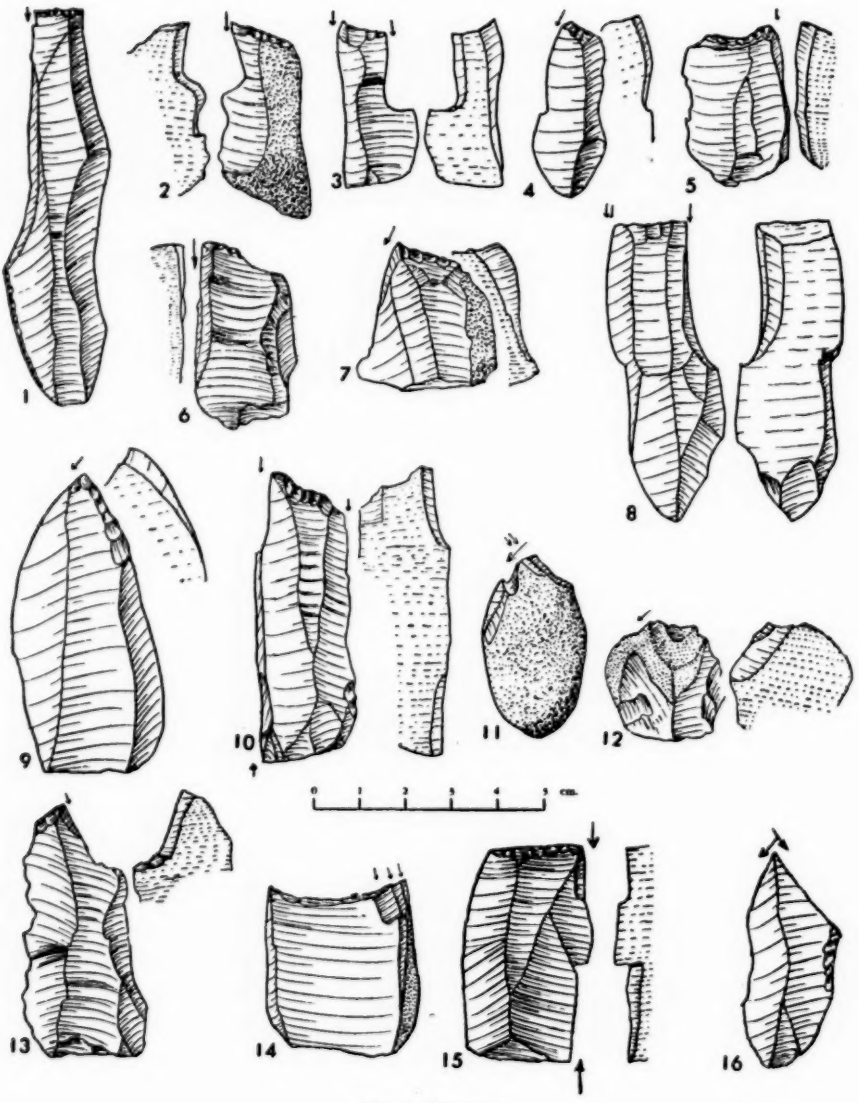


Fig. 7. Gravers.

The fact that the notches are arranged in so symmetrical a fashion, with the rest of the flake untouched, must mean that the notches were produced intentionally to facilitate hafting into a shaft. These pointed and bilaterally notched

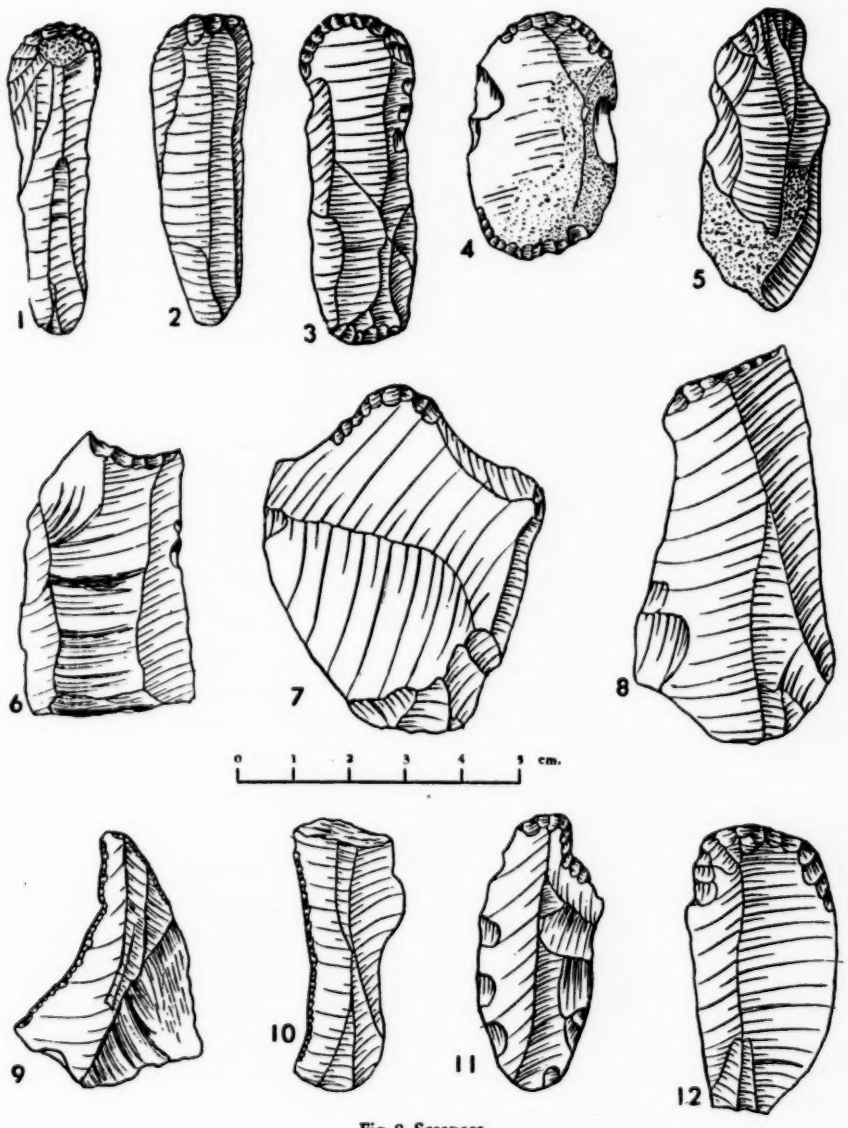


Fig. 8. Scrapers.

flakes are therefore a most primitive form of arrow-head. It is very probable, as well, that the 45 thin pointed blades and flakes (mentioned above) were also used as arrow-heads, even though they are without notches.

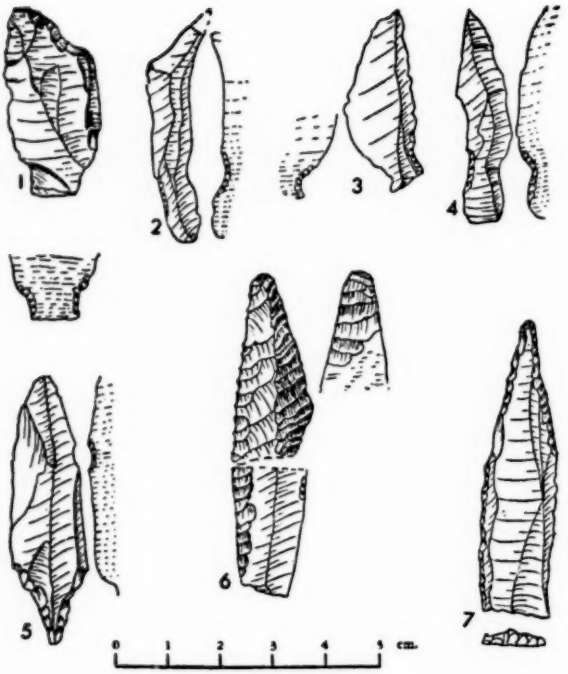


Fig. 9. Arrow-heads.

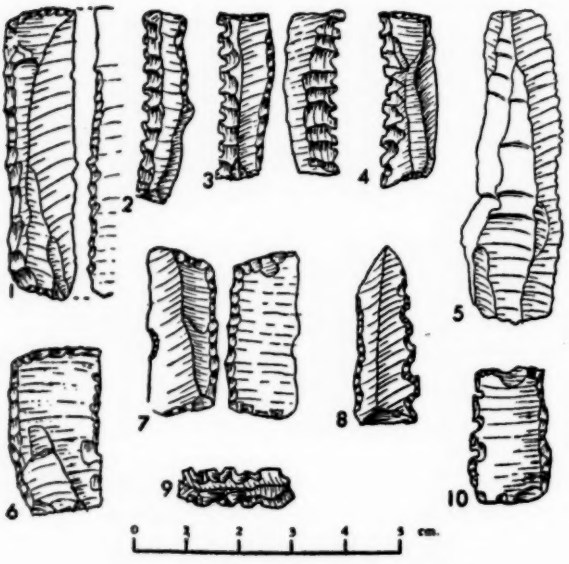


Fig. 10. Sickles and denticulated blades.

(b) Elaborate form. Only 3 elaborate arrow-heads were found. No. 5 is an arrow-head with trimmed tang but without wings, it has a small fine notch on the bulbar surface. No. 7 is a triangular pointed blade retouched along the whole of one edge, a part of the other, and across the base. No. 6 is a pointed blade (broken) covered by pressure retouche.

Natufian sickle-blades: All the 'sickle-blades' were made on sectioned square end-blades blunted along one edge, across the tip and the base. A lustre is found along the untrimmed cutting edge. Fig. 10, No. 1 was trimmed on the under surface; No. 7 was made with a small, fine notch on the cutting edge.

Denticulated blades: These were made on sectioned blades blunted down one edge and across the tip or the base. The teeth are

deep, serrated and produced by pressure (fig. 10, Nos. 2, 3, 4); No. 8 is a pointed blade; No. 9 had teeth along both edges; a lustre was noted along the teeth.

Knife-blades: Fig. 11, No. 2 is a fine long knife-blade trimmed along both edges. Fig. 10, No. 5 is a long knife-blade, without trimming, and with one lustrous edge.

Axes: (Fig. 11, No. 1). The outline of the axe is triangular, flaked on both faces with a straight cutting edge refined by flaking; it had been prepared for polishing, but had never been polished.

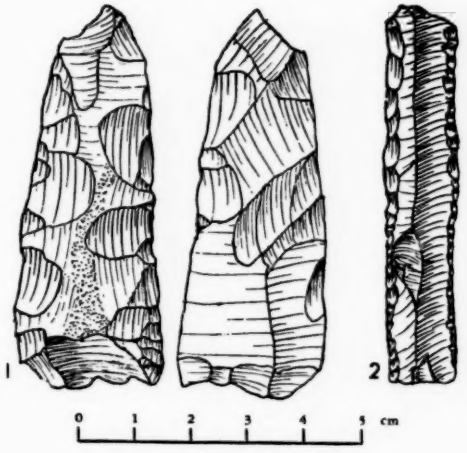


Fig. 11. Axe and knife-blade.

Blades with inverse retouche: (Fig. 12). No. 2 is a blade trimmed on both edges. One edge on the upper face and another, on the bulbar surface, were trimmed by pressure flaking. No. 3 is a pointed flake, part of one edge on the upper face was trimmed by pressure-flaking; the two edges on the bulbar surface were trimmed, one by fine nibbling retouche and the other by pressure-flaking. No. 4 is a curved-back point partly trimmed on the upper face and obliquely retouched on the whole edge of the bulbar surface. Nos. 5, 7, 8 and 10 are pointed blades trimmed on the bulbar surface only; Nos. 10 and 12 are trimmed by nibbling retouche on the bulbar surface. Nos. 6, 13 and 14 are blades trimmed both on the upper and bulbar surfaces; No. 11 is a small point trimmed obliquely on the bulbar surface; No. 9 is a thin pointed blade trimmed with fine nibbling retouche on the bulbar surface near the tip.

Pseudo-awl: Fig. 12, No. 1: made on a flake which retains a patch of cortex.

Microliths: Microliths and the débris of their manufacture are abundant.

Micro-scrapers: The microlithic variety of scrapers is represented by 5 end-scrapers (fig. 13, Nos. 19, 21 and 23).

Micro-burins: (Fig. 14). 15 micro-burins have been collected in the deposit, 9 of them are of butt type variety with a notch on the left side or on the right; the tip-type of micro-burin is represented by 6 examples with a notch on the right side, or on the left. Two micro-burins are mis-hits.

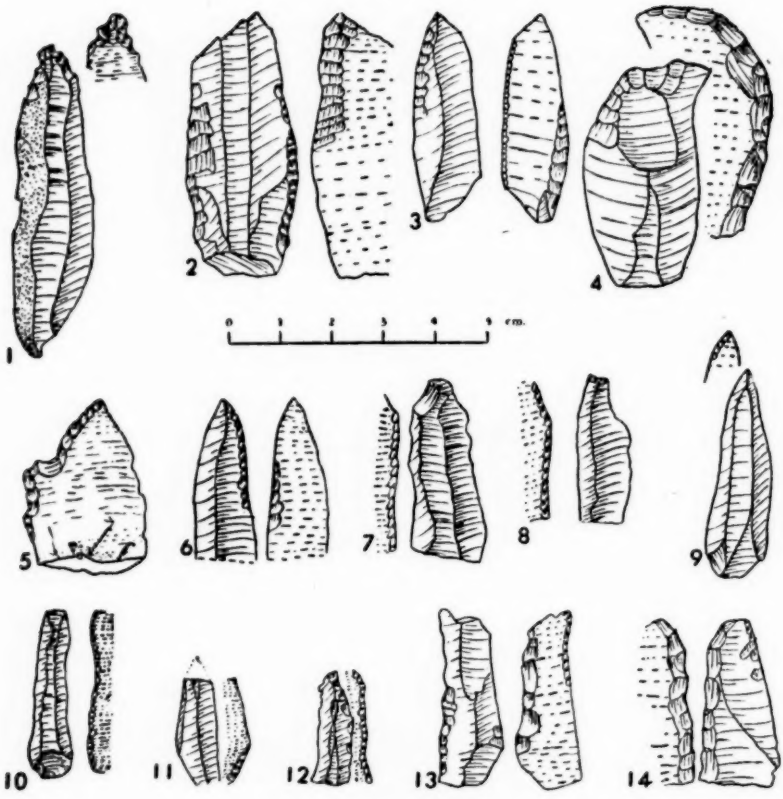


Fig. 12. Blades with inverse retouche.

Crescents: (Fig. 13, Nos. 1-5, 7, 8). Eight crescents are of Heluan type, three being ordinary and one with a blunted back; No. 12 is a crescent form blade retouched on both edges of the bulbar face only.

Blunted blades: Fig. 13, Nos. 6, 13 and 14 are blades blunted down one side; No. 20 is a blade blunted down one side and across the base; Nos. 10 and 22 are obliquely blunted blades.

Various forms: No. 11 is a small pointed blade trimmed on the bulbar surface; No. 9 is a small scalene triangle; Nos. 15, 17 and 18 are blunted blades.

Bone objects: Fig. 15, Nos. 1-3 are awls made of bone splinters with the point well polished; Nos. 4 and 5 are bone splinters with parallel grooves cut in; fragments of fine needles (broken, not figured) have been found as well.

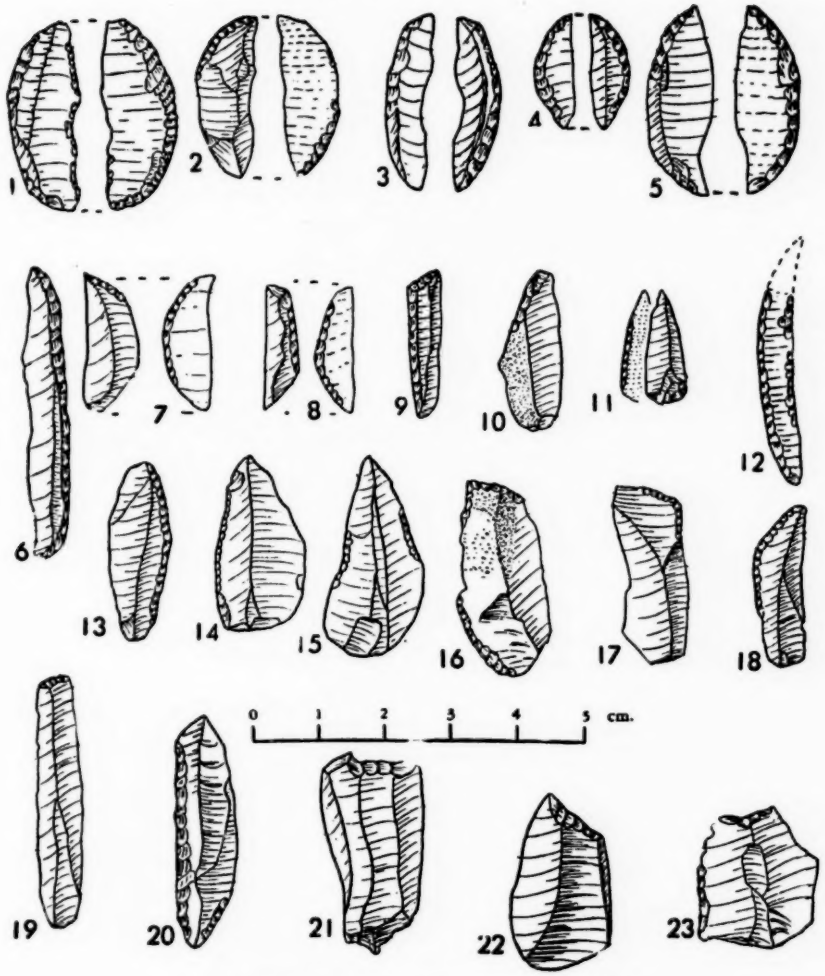


Fig. 13. Microliths: cresents, scrapers, and blades.

Furthermore a bead made of a truncated length of a bird bone-shaft, 3cm. long with smoothed edges, has been found.

Pendant: A sea-shell *Lima (Radula) Lima* Linné was pierced and used as such.

Pottery: The pottery was made by hand from a local clay which in its natural condition undoubtedly had a considerable quantity of grits (limestone, sandstone, and quartz). Large grits are found embedded in the ware of the sherds.

The firing, which was done on an open hearth, was, for the most part, rather poor; the various fragments are of different hardness showing that they were fired at different temperatures. Some of the sherds are very brittle and porous: others, of course, were hardened or 'fossilized' by the infiltration of calcium carbonate (see p. 18. — Figs. 16, 17).

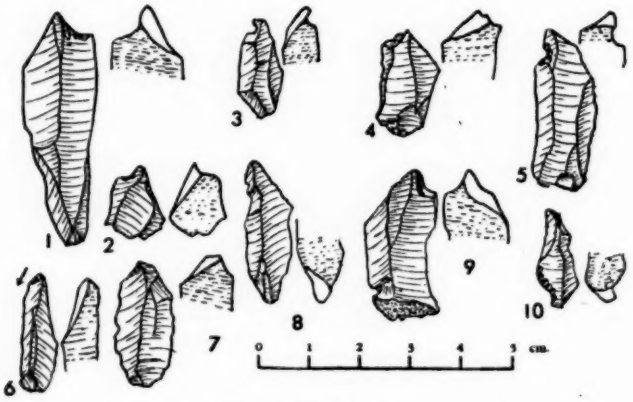


Fig. 14. Micro-burins.

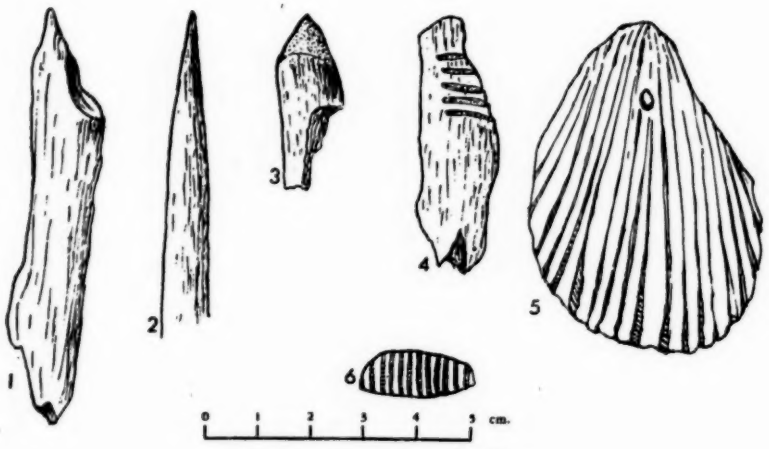


Fig. 15. Bone objects and pendant.

The sherds which are from rims, walls, bases, and handles, are too small to indicate the size and shape of the pots. Basal fragments are flat and thin, and belong to flat-bottomed pots; there are no traces of mat impression on them.

The handle-fragments came from small, pierced ear-handles, knob-handles, and loop handles.

Some of the sherds bear incised ornaments—parallel grooves and herring-bone. Four fragments were painted with red wash. The sherds show traces of wet hand-smoothing on the damp clay both inside and outside. The colour ranges from brown, red-brown to yellow-brown, yellow to gray and gray-brown.

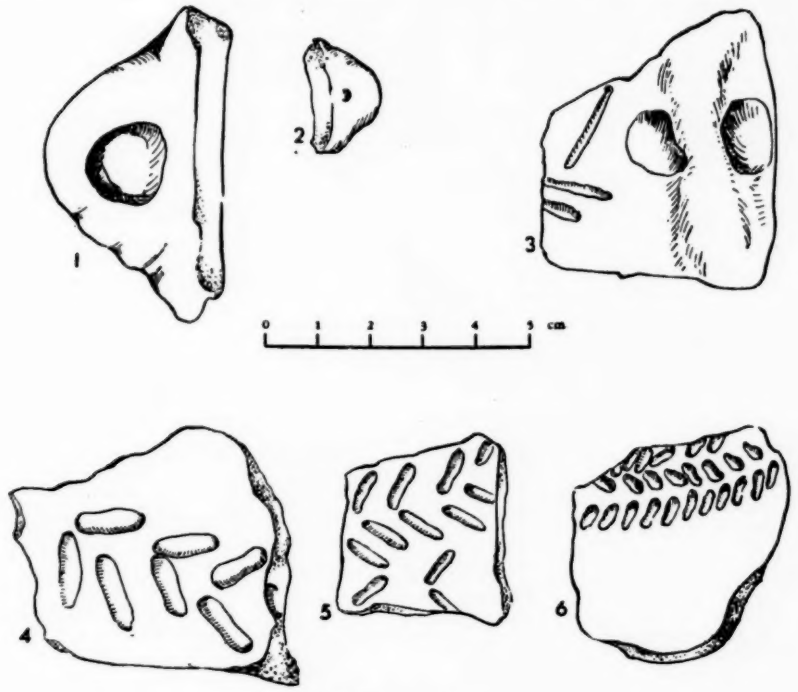


Fig. 16. Incised ware.

B. Interpretation:

A homogeneous culture embedded in an undisturbed deposit was unearthed in Level B of Abu Usbə.

The cave Abu Usba was occupied by a very small community with a poor subsistence during the period that layer B, the Usbian, was deposited. There is even the possibility that the Usbian settlers inhabited it during certain seasons of the year only, rather than continuously. In any case, the Usbian people were

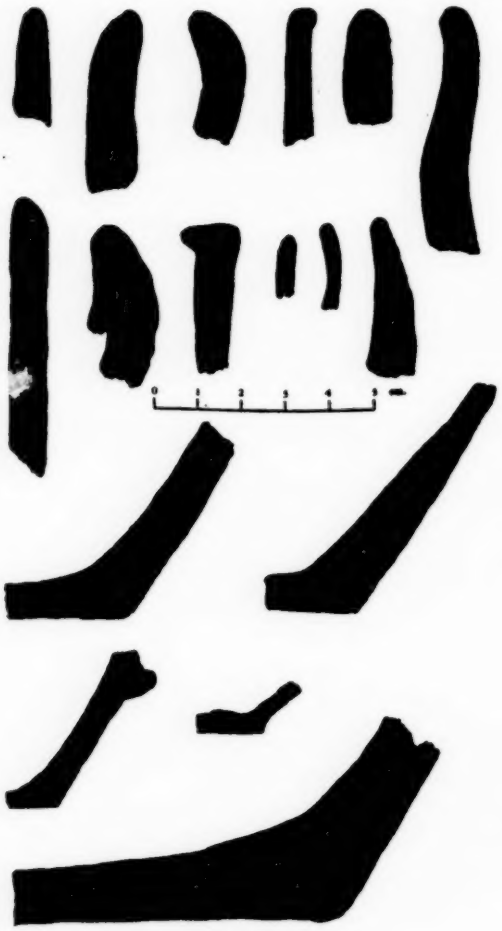


Fig. 17. Pottery.

primarily hunters and fishers. Bones of wild animals were used for tool making; microliths served to compose tools for hunting and fishing. A considerable number of animal bones have been discovered, most of them split for extraction of marrow; some of them were burnt.

There is no evidence for the herding of domesticated animals, but artifacts, the sickle blade (truncated), the axe, and the pottery, show that the Usbians had taken the first step towards agriculture.

The religion and art of the Usbians remain obscure. A few scratches or parallel incisions were found on bone. No remains of burials were discovered; only an isolated human tooth was collected from the débris.

When an analysis is made of the Usbian flint industry, there is little doubt of its affinities with the Upper Natufian found in other cave sites in Palestine. Features of both the Natufian and the Usbian are the presence of: (1) microburins, (2) crescents with blunted back or of Heluan technique, (3) blades with inverse retouche, (4) Natufian sickle blades made on sectional blades with a blunted back, (5) gravers on transverse or oblique trimmed blades, (6) retouched microliths, (7) scalene triangles, (8) axes — similar to the type discovered at the cave el-Wad, (9) various scrapers (the true core-scraper is rare in the Usbian).

Besides the above flints, however, there are other tool forms in the Usbian which do not occur in the Natufian. These are (1) arrow-heads of primitive form, (2) arrow-heads with tang but without wings, (3) denticulated blades or saws made on blunted square-formed blades. Moreover, the Usbian use of pressure technique on some of the flints did not occur in the Natufian.

As I have pointed out in my preliminary report, the fact that the Usbian has definite features in common with the Natufian, but on the other hand has had new tool forms and pottery, shows that it derives directly from the Upper Natufian, but forms a new and distinctive stage.

If the flint industry of the Usbian had not been accompanied by pottery, it would probably have been considered merely a later phase of the Natufian. The presence of pottery, and other characteristics, place it in a post-Natufian period, *i.e.*, in the Neolithic. This is the first time pottery had definitely been recognized in such an early deposit in Palestine.

It should be mentioned in this connection, that Miss Garrod found some ill defined potsherds at the Shukba cave in Western Judaea and at the cave el-Wad. She writes of those from the latter cave as follows:

> 'Intrusive pottery sherds were fairly abundant in the upper part of B-I, but diminished towards the base. The majority of these are Byzantine, but a certain number are of Early Bronze type. When all the datable sherds have been eliminated there remains a handful of fragments of coarse ware that are most probably Early Bronze, but cannot be identified with complete certainty as they give no clue to the shape of the vessels to which they belong. If there is indeed contemporary pottery in the Upper Natufian, it is represented by these sherds, but in view of the fact that at Shukba pottery is undoubtedly absent, I think they must be put aside.'

Thus, if the 'coarse ware' at Shukba and el-Wad had been found in an undisturbed deposit, part, at any rate, of the Upper Natufian of these caves would have been considered post-Mesolithic or Neolithic. It is in layer B of Abu Usba, therefore, that there is clear proof of the beginning of a new cultural phase in the old Mesolithic tool tradition.

It would seem that this transition from the Mesolithic to the Neolithic occurred through a simple evolution of the material culture, probably without influence or intervention of any ethnic movement. The cultural evolution was given impetus by the struggle for better conditions of subsistence and by an adaptation to the natural environment of the coastal plain.

One other point should be mentioned briefly here in connection with the position of the Usbian in the relative time scale of Palestine. As G. Haas will go into detail to show in part 3, the fauna from the Usbian resembles closely that of the Natufian, the main difference being an absence in the Usbian of certain carnivora. He also points out that there has been a distinct faunal change since the deposition of the Usbian.

The excavations at Jericho (during 1935-1936), at Abu Usba and at Sha'ar ha-Golan on the Yarmuk, established the main lines of the development and succession of the Neolithic of Palestine, and showed clearly that the Neolithic lasted longer than had formerly been believed. It seems that many cultural stages arose and disappeared during this long period, only a few of which have so far been discovered and studied.

The chronology of post-Mesolithic cultures in Palestine, established by R. Neuville in 1934, is now out of date and does not agree with the present state of our knowledge of this problem.

The link between 'Tahunian', Ghassulian and Cananean as it was claimed by Neuville can not be considered correct any more.

The bottom-level cultures from excavated *tells* called by Neuville 'Cananean' are not homogeneous; they are composed of various cultural stages which are neither necessarily contemporary nor even linked.

The Jericho excavation showed clearly that a considerable gap existed between 'Tahunian II' (Jericho IX-XII) and the Jerichoan (Jericho — VIII). To the Jericho terminology I would only remark that the reference to 'Tahunian' is not correct, because the 'Tahunian' so named after a surface station at the Wadi Tahuneh (near Bethlehem) was never discovered *in situ* at Wadi Tahuneh, and we do not know till now its place and relation in the chronological scheme of prehistoric cultures. Trial pits made by me in 1941 in the Wadi Tahuneh were without results.

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3. THE FAUNA OF LAYER B OF THE ABU USBA CAVE

G. HAAS

The author was given the opportunity of investigating the zoological material excavated by Dr. Stekelis in layer B of the Abu Usba cave. The material consisted mainly of remains of terrestrial vertebrates, of marine fish, and of a few fresh-water and marine molluscs. This paper will present a systematic survey of the material as well as a comparative discussion and a climatic interpretation. A small number of the specimens had to be laid aside because of the lack of literature and of comprehensive collections for comparison.

A. A Systematic Survey of the Usba Fauna: Mammalia

Insectivora

Crocidura cf. russula Herm. (figs. 1-3):* a large shrew, very common in Palestine today. 8 mandibles, length 13.25-14.25 mm., average 13.7 mm. 5 skull fragments, 6 femora, 1 humerus.

Crocidura cf. portali Thos. (figs. 4, 5): a small shrew, rarer at present than the above. 3 mandibles, length 11.75-12.5 mm., average 12.1 mm. The figures show striking differences in the structure of the processus angularis as compared with the former species.

Erinaceus cf. carmelitus Bate. 1 fragment of left mandible. Pronounced cingulum of the last P—a characteristic of this species.

Chiroptera

Rousettus stekelesi sp. n. (figs. 6, 7): Type: 1 right mandible, slightly damaged at angulus and at symphysis. C_1 P_3 P_4 and all molars complete. An adult with strongly worn dentition. The following table compares this specimen (C) with two of *R. aegypticus* (A, B), a bat common today in Palestine.

* For figures see Plates 1-4.

	A	B	C
Distance of symphysis from end of proc. artic.	28	33.5	34
Maximal depth of ramus measured under middle of last molar.	3.5	4.5	5
Distance of anterior border of C from caudal border of last M.	—	18	18

A is a young *R. aegypticus*, last M not erupted. B is an old *R. aegypticus* with the 3 Ms. worn to root. The table reveals primarily the larger dorsoventral extension of the ramus in the fossil specimen. There is, as well, a striking difference in the structure of the coronoid process, which, in *R. aegypticus* (fig. 8) rises more steeply, is broad and rounded at the upper margin and forms a relatively shallow concavity towards the angular process. In the fossil form the process as a whole bends backwards at a more acute angle; its upper margin tapers to a slender peak, which points clearly in a caudal direction. In A and B the cranial border of the process is smooth, in C it is slightly curved and bears a comblike crest about 3 mm. in length in its upper third. When the specimens are viewed side by side with their horizontal lower margins parallel and overlapping, the caudal end of the coronoid process is seen to jut backwards more pronouncedly in the fossil species than in *R. aegypticus*. A line drawn through the end of the angular process perpendicular to the horizontal lower margin would intersect it at a considerable distance beyond the caudal end of the articular process. In B, on the other hand, such a perpendicular line would cut the horizontal at least 2 mm. in front of the end of the articular process. In other words, the blade of the coronoid process is more pointed and bent backwards in the fossil species, while in the recent species the whole structure appears blunter and more erect. When viewed from inside the post-alveolar portion of the mandible appears more massive in C and the anterior margin of the coronoid process bears an appreciable thickening, while it is sharp and blade-like in A and B. There is also a thickening in the incision between the articular and coronoid processes of C; this is entirely lacking in A and B. The angulus, which is incomplete, hardly lends itself to a comparison; however, the short preserved basal part beyond the condyle indicates that it was not directed obliquely forward as in A and B, but ran vertically downward, possibly even in a slightly caudal direction. While the angular process in A and B passes in a smooth shallow curve into the alveolar portion, in C it is set off more sharply against the alveolar part. When comparing the yet unworn teeth of A with the moderately worn set of C it is obvious that the crowns of C are both broader and longer. The length of the dental row from the second post-canine to M_2 is 11 mm. in A, against 12 mm. in C. In both cases the teeth are very closely set. In a caudal view of the jaws it is seen that the coronoid process in C is bent laterally, whereas in A and B it continues the general vertical direction of the alveolar process. These considerable differences appear sufficient to justify the assignment of specimen C to a new species.

Rhinolophus cf. ferrum-equinum L.: 1 left mandible almost complete; four caudal teeth preserved. The dental row may have been somewhat longer than in recent specimens. (Approximately 10 mm. against 9.2 maximum length, as given in *'Mammifères de France'*). The jaw-length of 16 mm. (condyle to symphysis) corresponds to that of recent specimens.

(?) Rhinolophus sp. A.: 4 fragments of humeri.

(?) Rhinolophus sp. B.: 1 fragment of humerus.

These two species are smaller than *Rh. ferrum-equinum.* The species *euryale* and *blasii,* respectively, might be considered, since both occur in Palestine.

(?) Miniopterus schreibersi Natt.: 2 fragments of humeri.

Note: The remains of limb-bones of two further species of Chiroptera have not, as yet, been identified.

Carnivora

Hyaena cf. crocuta Erxleben: one left P d^2. One proximal end of r. metatarsal II almost double the size of that of an adult *Hyaena striata.*

Vulpes sp. (? nilotica): 2 fragments of mandibles. Three P. One C. Parts of left pelvis. One distal end of tibia. Olecranon ulnae.

(?) Canis cf. aureus L.: one r. metacarpal II resembles that of *Canis aureus,* though it is somewhat slenderer and longer, measuring 55 as against 50 cm. The determination is therefore uncertain.

Meles meles L.: one fragment of l. maxilla with alveole of C and remains of two Pm. One distal end of humerus.

Martes sp.: one fragment of r. pelvis, similar to *M. foina.* (?) Metacarpal V. *Martes foina* is known from Palestine, but at present appears to be very rare or possibly extinct.

Felis (? sylvestris Schreber): one basal phalanx. One distal fragment of metatarsal. One olecranon ulnae. All remains are considerably larger than bones of *F. domestica;* this would point to *F. sylvestris* rather than to *F. ocreata.*

Rodentia

Lepus spp.: numerous teeth, none of which allows of a specific diagnosis.

Sciurus sp.: three fragments of humeri. Probably *S. anomalus Gueldenstaedt,* which was often found in the Carmel caves by Bate.

Spalax cf. ehrenbergi Nhrg.: very numerous remains; these certainly do not belong to *S. fritschii,* which is much bigger than the present specimens.

Eliomys sp. n. (figs. 9 and 10): *Type:* One left mandible with preserved I. The following are some measurements of three spp. of *Eliomys* for comparison with our type.

	length of mandible
Specimen of Abu Usba:	19 mm.
Eliomys melanurus from Trans-Jordan:	22 mm.
Eliomys quercinus ('Mammifères de France')	17-18.5 mm.
Eliomys quercinus (fossil, from Grotte de Grimaldi)	21.5 mm.

As regards shape, the fossil mandible resembles *Eliomys quercinus,* though it is strikingly smaller. *Dryomys*-mandibles are smaller still (15.5 mm.).

Differences between *E. sp. n.* of Abu Usba (U) and *E. melanurus:* Apart from the difference in size, the mandible is much stouter than in *E. melanurus,* especially in the region anterior to the molars. In U there is a crest running forward from the coronoid process

on its external face to the level of M_1. Thence it bends vertically downward and joins a second slightly descending crest, which merges into the lower edge of the articular process. In *E. melanurus* the lower crest is similar to that of U, but the connecting part runs more obliquely from cranio-ventral to caudo-dorsal. The crest originating from the coronoid process is much less pronounced.

In *E. melanurus* the articular process is more distinctly set off than in U. There are striking differences in the angular portion, which is bent outward in U, while in *E. melanurus* it possesses a pronounced posteriorly directed process with a blunt end. In U the angular fenestra is comparatively much smaller than in *E. melanurus*. As viewed from behind, the mandibular angle in *E. melanurus* describes a much stronger inward curvature below the fenestra than that of U. The pillar bounding the fenestra at its cranio-ventral border forms with the ramus mandibulae a less obtuse angle than in the specimen of Abu Usba. The incisivus is relatively shorter in U, its point lying almost exactly in the line, which would connect the medium borders of the molar alveoles. In *E. melanurus* the incisivus projects appreciably beyond this line. Viewed from inside, the slightly twisted incisor of *E. melanurus* presents its posterior face, whereas in U there is no such twist.

Differences between the specimen of Abu Usba and *E. quercinus:* (according to photos in *'Mammifères de France'* and *'Grotte de Grimaldi')*. There is a remarkable difference in the base of the coronoid process which rises in a smooth concave curve in U, while there is an abrupt rise in the specimen from Grimaldi. On the inner face of the articular process the specimen from Grimaldi is provided with a distinct thickening which is absent in the Usba jaw. However, the general form of the angular process of U exhibits more resemblance to *E. quercinus* than to *E. melanurus*. The photo of the coronoid process in *'Mammifères de France'* shows a more massive structure and a blunter tip than that of the Abu Usba specimen.

Special attention should be paid to the striking difference in size between our specimen and the two other species. The animal must be supposed to have been somewhat larger than the European *Muscardinus avellanarius* (length of mandible 15 mm. against 19). Unfortunately, I have no material for comparison with *Dryomys,* which, however, must be excluded owing to its smaller size.

Microtus cf. guentheri D. A.: very numerous remains.

Rattus cf. rattus L.: two fragments of maxillae and two of mandibles, with all molars preserved. During my visit to the cave one spec. of *Rattus rattus frugivorus Raf.* was caught.

Mus musculus L.: numerous remains, inter alia 10 mandibles.

Apodemus spp. (figs. 11, 12, 13, 18): the mandibles belonging to this genus correspond approximately to *Acomys* in size, but may easily be distinguished from the latter by their coronoid process, which is slender, sharply set off and strongly projecting in a caudal direction, whereas *Acomys* is characterized by a short and blunt coronoid process.

The mandibles of the present genus are distinguished from those of *Mus musculus* by their greater size (Maximum of *M. musculus* 13.5 mm., *Apodemus* 14.5-21 mm.). In addition, the coronoid process in *Apodemus* appears more sharply set off against the ramus than that of *M. musculus,* since it is slender from its origin, while that of *M. musculu*

tapers. In *Apodemus* the coronoid process is directed more caudally. The ramus is straighter in the region of the ventral margin opposite the alveolae. The ventral inflection of the angular process is less pronounced than in *M. musculus*, whereas the whole of the angular process in *M. musculus* is relatively deeper in the dorso-ventral direction than that of *Apodemus*. Hence, the emargination between the coronoid and the angular process is rather angular in *Apodemus* and more rounded in *Mus musculus*, whereas it is much shallower in *Acomys*, which is characterized by a very stout articular process. In the lateral face of the mandible in *Apodemus*, the contour of the root of the incisor projects strongly. From the apex of the alveolar tubercle, a ridge runs horizontally backwards and then bends upwards at an obtuse angle, eventually merging into the articular facet. In *M. musculus* this ridge is more or less broken or even incomplete. The alveolar tubercle is always nearer to the upper margin of the mandible than in *Apodemus*. In *Apodemus*, the articular process projects caudally beyond the angular process, whereas in *M. musculus* the two processes terminate in one perpendicular line. The following are the measurements of the complete *Apodemus* mandibles from Abu Usba:

Table I:

1.	12.25
2.	12.50
3.	12.75
4.	14.60
5.	15.25
6.	15.50
7.	16.50

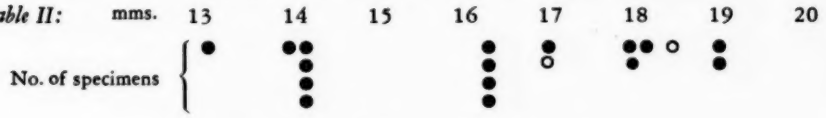
The lengths recorded here distinctly fall into two groups, numbers 3 and 4 being separated by a gap of almost 2 mm.

The size of the last three specimens exceeds the measurements recorded in *'Mammifères de France'* for *Apodemus sylvaticus* (14-15 mm.). The condylo-basilar length of *A. sylvaticus* is 23-25 mm. according to Aharoni and 24-26 according to *'Mammifères de France.'*

Since the condylo-basilar length of *A. flavicollis pohlei* is stated by Aharoni to be 25-29 mm., the largest of the Usba mandibles might well belong to the latter species, which, according to Aharoni, is found today in the Nussarieh Mountains north of the Lebanon.[1] Several fragments allow of measuring the length from the posterior border of the symphysis to the end of the articular process.

Distance of posterior border of symphysis from end of articular process.

Table II:



white circles refer to incomplete specimens.

There is again a striking absence of the middle size class, so that two groups may be distinguished. Even the specimens of the upper size class up to 16.5 mm. exhibit the above outlined characteristic difference from *Acomys*.

[1] This form, however, should belong to the *mystacinus* group, as I have been informed at the British Museum (Natural History). It has been found, since, in Upper Galilee and the Carmel area

The smaller mandibles probably belong to the *sylvaticus* group, the bigger ones to the *mystacinus* group of this genus. The upper molar series figured in fig. 13 belongs certainly to this last group.

Acomys carmeliensis sp. n. (fig. 15, cf. also figs. 14, 16, 17): very numerous remains. Inter alia 30 mandibles, 10 maxillae, 1 complete facial part of skull with palate. These were at first thought to belong to *Acomys cahirinus* as the structure of jaws and teeth seemed to indicate. This assumption was, however, disproved by the total absence of typical *cahirinus* limb bones. The limb bones which, no doubt, belong here, are much more gracile and slender than those of *cahirinus*, the dilatation of the distal end of the femur especially being far less pronounced (cf. fig. 16). On closer examination of the mandible the coronoid and articular regions were found to exhibit certain differences. The fragments from Abu Usba possess a much more prominent coronoid process than recent *cahirinus* specimens. This pointed coronoid process may certainly be considered a primitive feature as compared with the abruptly blunted type of the recent species. Less significance may perhaps be attributed to the shape of the articular process, which appears to exhibit more individual variation on the whole. It seems justified to assume that these fragments belong to a new species of *Acomys* which may be provisionally named *A. carmeliensis*.

Cricetulus cf. migratorius Wagner. (fig. 19): three mandibles. This species seems to be rather rare in Palestine.

Meriones cf. shawi Thos.: very numerous remains, inter alia ten fragments of maxillae and thirty-four mandibles, all of which correspond completely to recent material.

Gerbillus sp.: one mandible with complete dentition. An exact determination was impossible owing to the lack of material for comparison.

Note: Of the large number of remains, particularly of limb bones, which appear to belong to small rodents, only a fraction could be provisionally assigned to the species dealt with above. The number of species may well be larger than could be deduced from the mandibles preserved.

Artiodactyla

Sus scrofa L.: numerous remains of teeth, jaw fragments and phalanges.

Bos spp. (figs. 20-23): the few remains may be assigned to two species differing in size. One must have been approximately as big as domestic cattle, the other possessed molars about ¼ larger. Of the smaller species one M_2 fragment, M_2 P^2 M^2 and one basal phalanx (cf. fig. 20) were found. Of the larger species one M^1 fragment, one M^3, two Pd^4, two Pd^2, one M_3 before eruption (fragment), fragment of mandible with P_2 in situ. In addition, a few other fragments, among these a basal phalanx (cf. fig. 21). A rather slender phalanx (figs. 22-23) belongs probably to the same species (female ?); it is too plump for a big cervid.

Dama mesopotamica Brooke.: I_3, M^1, M^3 before eruption, Pd_2, two tali, proximal end of tibia, calcaneus.

Capreolus capreolus L.: M_1 (incomplete), one mandibular fragment without teeth, one basal and one second phalanx, one proximal metapodial joint, one distal fragment of metacarpal.

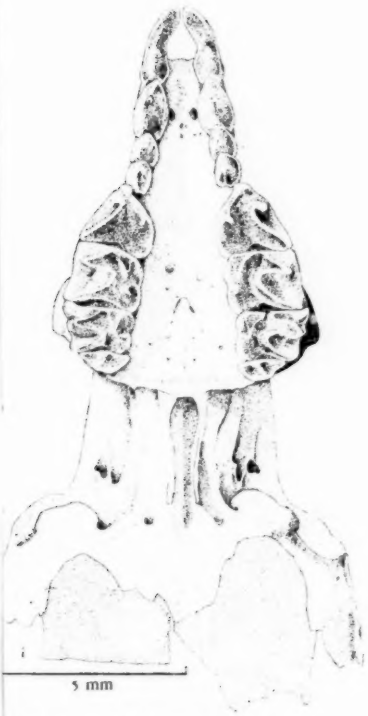


Fig. 1. *Crocidura russula*. Abu Usba, largest specimen.

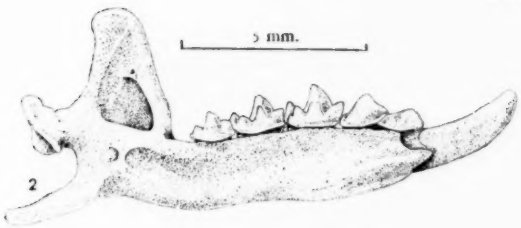


Fig. 2. *Crocidura russula*, Abu Usba, left mandible, from inside.

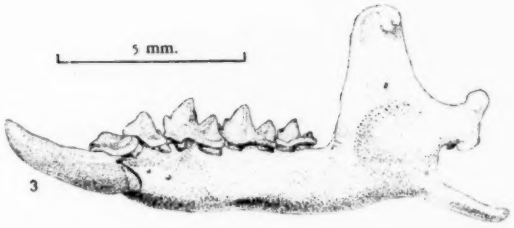
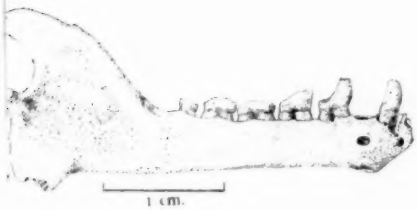
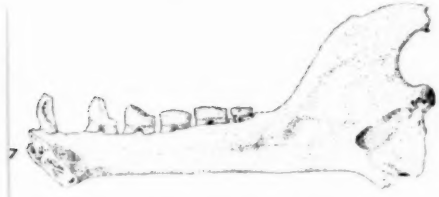
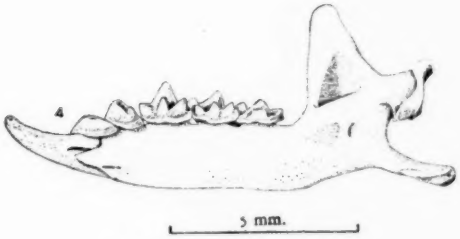


Fig. 3. *Crocidura russula*, Abu Usba, left mandible, from outside.





Figs. 6, 7. *Roussettus stekelesi sp. n.*, Abu Usba, right mandible, from outside and inside.



Figs. 4, 5. *Crocidura cf. portali*, Abu Usba, right mandible, from inside and outside.

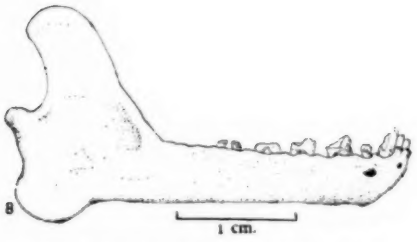


Fig. 8. *Roussettus aegypticus*, recent, old specimen, right mandible, from outside.

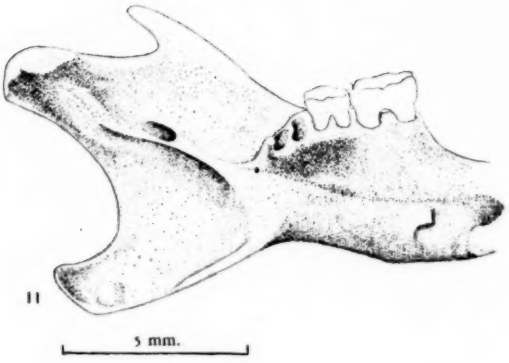
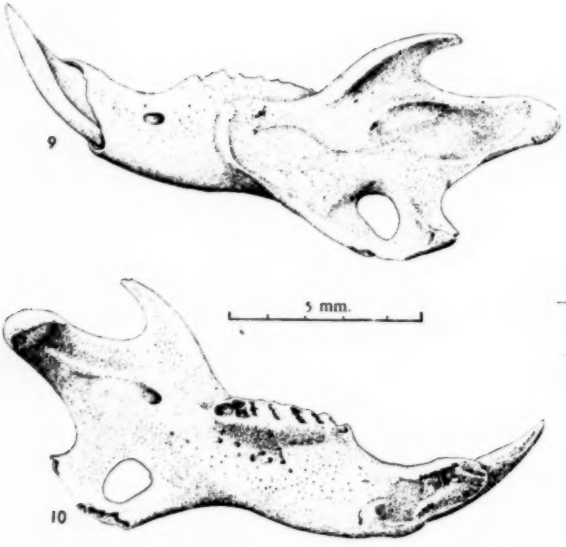


Fig. 11. *Apodemus sp.*, Abu Usba, left mandible, from inside.



Figs. 9, 10. *Eliomys sp.*, Abu Usba, left mandible, from outside and inside.

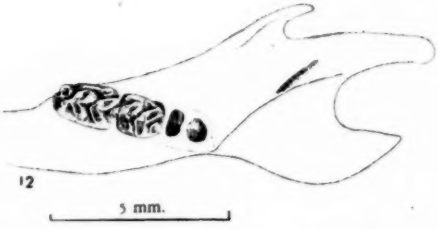


Fig. 12. *Apodemus sp.*, Abu Usba, right mandible, from above.

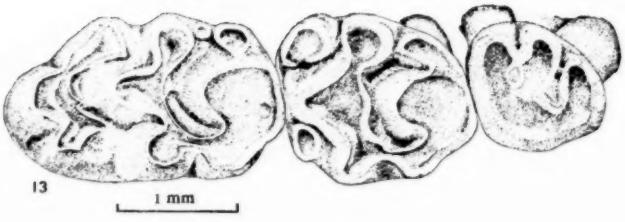


Fig. 13. *Apodemus sp.*, Abu Usba, upper right molars.

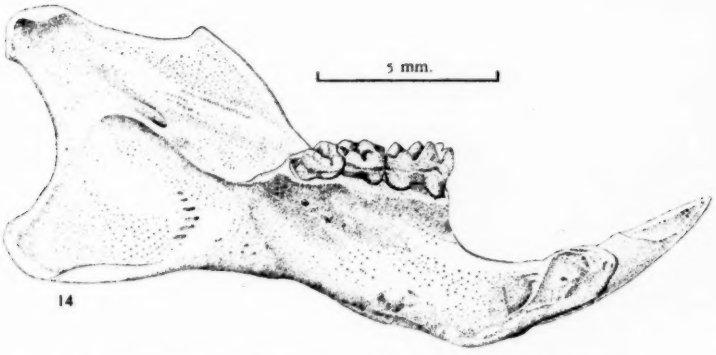


Fig. 14. *Acomys cahirinus*, recent specimen, left mandible, from inside.

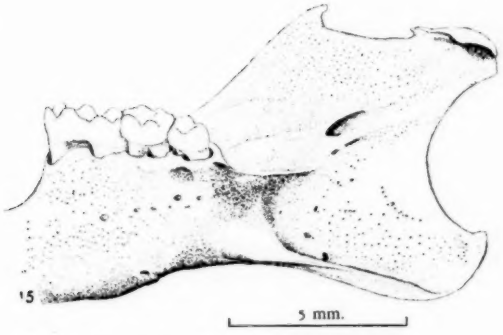


Fig. 15. *Acomys carmeliensis sp. n.*, Abu Usba, right mandible, from inside.

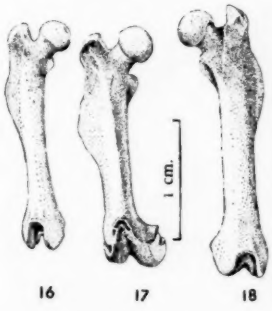


Fig. 16. Femur of *Acomys sp.*, Abu Usba.
Fig. 17. Femur of *Acomys cahirinus*, recent.
Fig. 18. Femur of *(?) Apodemus sp.*, Abu Usba

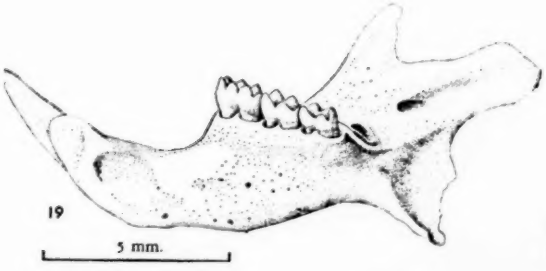


Fig. 19. *Cricetulus cf. migratorius*, Abu Usba, right mandible, from inside.

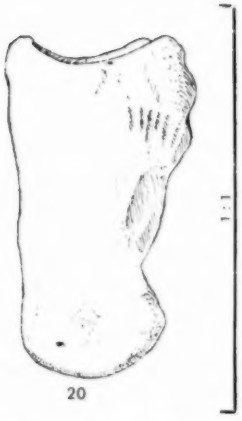


Fig. 20. *Bos. sp.*, small, Abu Usba, basal phalanx.

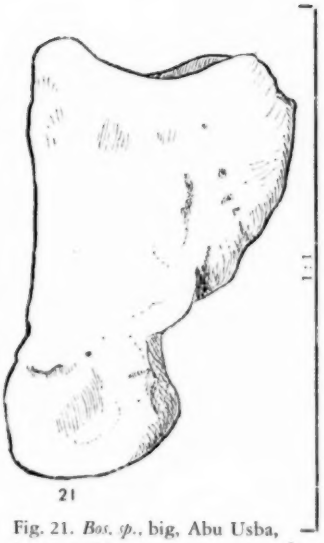
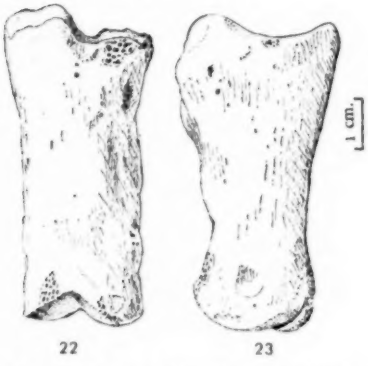


Fig. 21. *Bos. sp.*, big, Abu Usba, basal phalanx.



Figs. 22, 23. *Bos. sp.*, big, Abu Usba, basal phalanx.

Fig. 24. *Gazella sp., cf. decora*, Bate, Abu Usba, frontal and horn core.

Fig. 25. *Gazella sp., cf. esdraelonia*, Bate, Abu Usba, frontal and horn core.

Gazella spp. (figs. 24-25): in those fragments belonging to a gazelle, which as far as the teeth indicate, conforms to *G. arabica*, the mandible was strikingly higher in the region of the diastema than in recent Palestinian specimens of this species. Another group of fragments possess teeth which are pronouncedly larger than those of *G. arabica*. A frontal bone with the base of the horn core may be assumed to belong here. I believe that these remains may be referred to *G. decora Bate*, especially since the details of the frontal bone correspond to Bate's figure[2] in shape and size (fig. 24). Another frontal with horn core (cf. fig. 25) seems to belong to *Gazella esdraelonia Bate* as indicated by the position of the core, the form of its transverse section and the big deep supraorbital foramina. This assignment to Bate's fossil species must be considered as provisional, since Bate's species are based on almost complete upper skulls. Very numerous fragments of various skeletal parts and of teeth were insufficient for assignment to any particular species.

Capra spp.: numerous remains, which could not be further identified. Some teeth completely corresponded in shape and size to Fritsch's *Capra primigenia*, while others were exactly like those of a recent male of *Capra nubiana Cuv.* Other teeth were decidedly smaller than both these groups. The possibility of the existence of several races or even species cannot be excluded.

Hyracoidea

Procavia cf. syriaca Schreb.: I_1, one right mandible retaining stumps of teeth.

Perissodactyla

Equus cf. hemionus Pallas.: one P^4.

Aves

Note: only about one half of the very rich material of birds' bones have as yet been identified.

Alectoris cf. graeca.	Acrocephalus cf. schoenabaenus
Columba sp. (cf. livia)	Turdus spp.
Streptopelia sp.	Motacilla cf. alba
Vanellus cf. cristatus	Parus cf. major
Merops cf. apiaster	Lanius spp.
Pycnonotus cf. capensis	Sturnus cf. vulgaris
Erythropygia cf. galactodes	Passer cf. domesticus
Oenanthe cf. oenanthe	Carduelis cf. carduelis
Phoenicurus cf. ochrurus	Chloris cf. chloris
(?) Lusciniola sp.	(?) Serinus sp.
Luscinia cf. suecia	(?) Emberiza sp.
Phylloscopus cf. collybita	Fringilla cf. coelebs.

Reptilia

Testudo graeca L.	Chamaeleo chamaeleon L.
Ophisaurus cf. apus Pall.	(?) Lacertid
Agama stellio L.	Big Colubrid snake, perhaps Malpolon or Coluber
Ptyodactylus hasselquistii Donndorf	(?) Vipera sp.

[2] Bate, 1940; cf. Bibliography at end of paper.

Note: The remains of *Testudo, Agama* and *Chamaeleo* were especially numerous.

Amphibia

Pelobates syriacus Boettger	Hyla arborea Aud.
Bufo viridis Laur.	(?) Rana sp.

Remains of *Pelobates* very abundant.

Pisces

One vertebral centrum of a Selachian.
Several undetermined remains of Teleosts; among these one specimen appears to belong to *Chrysophrys* sp.

Molluscs

Dentalium vulgare da Costa	Venus cf. verrucosa
Dentalium dentale L.	Helix cavata Mouss.
Columbella rustica L.	Cyclostoma olivieri Sow.
Dolium galea L.	Chondrula septemdentata Roth
Glycimeris sp.	Levantina caesareana Mouss.

B. Discussion

(1) *Comparative:* The larger mammals, fragments of which were found in layer B of Abu Usba were undoubtedly hunted and brought there by man. The bones preserved include some vertebrae, fragments of mandibles, astragali, single teeth, phalanges and a few complete metapodia. The rest are splinters of the long bones and of a very few skull fragments.

The microfauna of the cave is rich and comprises a large number of complete skeletal parts. Some of the small animals, the chiroptera, some rodents and Gekkonidae, may have inhabited the cave itself. A larger part may have been amassed in the form of pellets by birds of prey. This was undoubtedly true of such a rodent as *Microtus,* of *Agama,* of *Pelobates,* and of small birds. The presence of *Pelobates* also indicates that nocturnal birds of prey were active as well as diurnal.

It is justifiable to assume that, due to the activities both of man and of birds of prey, the material of Abu Usba represents a faunal concentration from a rather wide area. The faunal assemblage is in the main of modern type, resembling most closely the Natufian described by Bate from the Mount Carmel caves in Wadi Mughara and Kabara, although with a few differences.

The Abu Usba and Natufian faunas have as many as 19 species or genera in common. Some of these are either no longer existing in Palestine, or are extinct as listed below:

Extinct: Erinaceus carmelitus	Bos spp.

Not present today: Hyaena crocuta
Sciurus sp.
Capreolus capreolus (only recently exterminated)
Dama sp.
Capra sp.
Equus hemionus.

Sciurus is not known today in the Carmel area but has been stated to occur in some wooded parts of Trans-Jordan. Tristram reports *Dama* from the Mt. Tabor region. *Capra* (ibexes) are found today only in the arid regions around the Dead Sea. The African species *Hyaena crocuta* has now been replaced in Palestine by the smaller *Hyaena striata. Martes* is either exterminated or very rare indeed.

The Natufian assemblage contains the following mammals, which were not present in Abu Usba:

Erinaceus cf. auritus
Canis familiaris matris optimae
Vormela peregusna
Ursus sp.
Panthera pardus
Alcelaphus sp.
Cobus canaanites
Equus caballus

(Of three fossil species of *Gazella* known in the Natufian, at least two may be represented in Abu Usba.)

The following species were found in Abu Usba, but not in the Natufian:

Crocidura cf. russula
Crocidura cf. portali
Rousettus stekelesi sp. n.
Rhinolophus cf. ferrum-equinum
Rhinolophus sp. A.
Rhinolophus sp. B.
(?) Miniopterus schreibersi
(?) Eliomys sp. n.
Rattus cf. rattus
Mus cf. musculus
Apodemus sp. (cf. sylvaticus and mystacinus)
Acomys carmeliensis sp. n.
Cricetulus cf. migratorius
Bovidae, big and small form.

In addition to these mammals, there are a number of birds, reptiles, amphibians and molluscs not known in the Natufian.

It is seen that the main difference between the Abu Usba fauna and the Natufian is an absence of the larger carnivores and ungulates in the Abu Usba, and the presence of its rich microfauna. Because of the close general resemblance between the two assemblages, it seems justified to assume that the absence of a microfauna in the Natufian collections is due to the lack of collecting birds of prey. It is also likely that the absence of big game and big carnivores is accidental.

It is in the fauna of small animals that the Abu Usba fauna exhibits characteristic differences from the fauna of today. To the above list of species common to the Abu Usba and Natufian but absent in Palestine today, can be added the following species found in Abu Usba only:

Acomys carmeliensis Rousettus stekelesi Eliomys sp. n.

Rousettus, Eliomys and *Acomys* are extinct species and are described in this paper. Of the abundant *Apodemus* remains some may be identical with the recent *Apodemus mystacinus* from Syria and Palestine, the others with *Apodemus sylvaticus.*

The difference between the Abu Usba and the present fauna in Palestine cannot be attributed to the activity of man and thus affords striking evidence of a faunal change since the deposition of layer B of the Abu Usba cave.

(2) *Climatic Conditions:* It is not surprising that the cave Abu Usba, situated as it is on the edge of a mountainous ridge, and beside a coastal plain which at times contained swamps and rain pools dammed behind dunes and sandstone ridges, presents species from more than one biotope. That rain pools existed, at the time of layer B of Abu Usba can be concluded from the remains of *Pelobates,* a nocturnal amphibian, which is today mostly restricted to the coastal sand dunes. It breeds in the rain pools, remains buried in the day-time, and must have been brought to the cave by nocturnal birds of prey. It should also be pointed out that there is a spring in the valley below the cave, which could have attracted a rather hydrophilous faunal assemblage in an otherwise more arid region. From the amphibian species such as *Hyla* and *Rana,* it can be concluded that the spring existed in prehistoric times.

The reptilian remains indicate that there must have been a fairly dense vegetation. *Ophisaurus apus* is a typical inhabitant of the Mediterranean evergreen scrub-wood and is at present found only in the northern part of Palestine, where this biotope is most typically developed. The abundance of *Agama stellio* and *Chamaeleo chamaeleon* also proves that steppe or desert conditions did not prevail.

From the bird remains it can be deduced that characteristic types of the present bird fauna were represented. *Columba,* being a rock-breeder, must have found its adequate biotope on the spot. *Parus, Pycnonotus* and a few other small birds point to the presence of wooded areas: this is particularly true of the numerous remains of *Turdus* sp. Thrushes are restricted today to the northern wooded parts of Palestine. There were a considerable number of winter residents such as *Sturnus* and *Vanellus.*

Of the land molluscs, *Cyclostoma olivieri* is of special significance, for this mollusc is today found only in the wooded parts of the Carmel and Western Upper Galilee, where it can retreat into deep moist rock crevices in the dry season. It is not found in the dry Central Judaean Hills, and consequently it appears that the average rainfall of the above mentioned wooded areas (700-800 mm. per year) is the minimum requisite for this mollusc's existence. *Cyclostoma* should therefore be considered an important indicator of the scrub-wood biotope and it must be concluded that the rainfall at this time was at least as high as today, if not somewhat higher. The overwhelming majority of mammals adds to the evidence for the existence of a Mediterranean scrub-wood on the Carmel in Abu Usba times. This is true of *Martes, Felis, Eliomys, Sciurus, Capreolus, Dama* and *Bos. Apodemus* seems to indicate that the forests were as dense as they are today, and possibly denser. Rodents typical of the steppes are lacking, while *Gerbillus* must have been introduced from the dune region. *Microtus* and *Spalax* may have inhabited alluvial soil of terra rossa extending into the coastal plain. *Lepus* may have lived as today in the outposts of the wood or in the belt of dunes, where a richer vegetation concentrates between the shifting dune hills.

It is more difficult to account for the occurrence of inhabitants of open land, such as *Hyaena crocuta, Equus hemionus* and gazelles, side by side with the typical forest dwellers. It is conceivable, however, that the coastal plain of savannah character, with its scattered rivulets and more or less perennial pools may have harboured these types.

The proximity of the wooded hills and more open coastal plain may also have accounted for the coexistence of the more palaearctic animals such as fallow deer, roe deer, marten, Bovidae, *Apodemus, Eliomys,* with the 'African' types such as the different antelopes, *Hyaena crocuta, Rousettus,* and *Procavia. Procavia,* a mountain-dweller, has existed in the Carmel from Acheulean times to the present day and is a relic of the old Ethiopian faunal assemblage. The coastal plain with its warmer climate must have been in Abu Usba times, as it is today, a road along which southern faunal elements could penetrate to the north and vice versa.

The numerous remains of *Capra* also present some difficulty. The only surviving wild goat of the country is restricted to the most arid mountains around the Dead Sea and to the southern desert, but other species, now extinct, may have existed in the Mediterranean woodland, which in some parts of the Eastern Mediterranean is still the habitat of the wild goat *Capra aegagros.* The occurrence of goats, therefore, does not necessarily indicate arid conditions.

Bate, in her interpretation of the faunal succession in Wadi Mughara has presented a theory that a greater preponderance of *Gazella* over *Dama* indicates more arid conditions. Based on this theory she has presented the conclusion that the Natufian fauna indicates much drier climatic conditions than exist in recent times. The number of *Dama* and *Gazella* remains in layer B of Abu Usba is much too small to be of use in attesting to Bate's theory, although there are sufficient fragments to justify the assumption of a preponderance of *Gazella.* However, since it must be supposed that gazelles and other antelopes such as described by Bate from the Natufian were more or less restricted to the stretches of open land, while *Dama* was a forest dweller, the true picture may have been blurred by a deliberate choice on the part of the hunters. Not too much importance should therefore be attached to the relative proportion of *Dama* and *Gazella,* especially if it is shown that the biotopes suitable to the two kinds of animals must have existed side by side.

Bate, although admitting that 'negative evidence may be suspect', also suggests that the absence of certain representatives of the microfauna is added proof of arid conditions. We have already suggested that the lack of microfauna in the Natufian assemblage is probably a matter of chance, and in any case deserts and semideserts are extremely rich in small rodents and reptiles.

We may sum up with the conclusion that the biotope of layer B of Abu Usba was not essentially different from that found on the spot today, except for a somewhat denser vegetation of the forest, correlated with a somewhat larger quantity of rain. The rain may well have been distributed in a manner similar to that of today, with the coastal plain containing a region of more or less perennial pools inland from the dune belt. Forest-dwellers existed side by side with inhabitants of the open land because of the proximity of the wooded mountain ridge and the savannah-like coastal plain.

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A Revised Earthquake-Catalogue of Palestine*

D. H. K. AMIRAN

Hebrew University, Jerusalem

In summing up the details of the present earthquake-catalogue it clearly appears that, as in most of the Mediterranean region, earthquake incidence in Palestine is moderate. The Jordan Rift Valley, however, is an aggravating factor as compared with those parts of the Mediterranean basin which have a light earthquake incidence only. This, as other parts of the Rift Valley chain which extends from Syria in the north to East Africa in the south, is tectonically still unstable. The most active and severe earthquake epicentre of the whole region is, therefore, the area of Alexandretta-Antakia (ancient Antiochia) in North Syria where the northern end of the Rift Valley hinges into the geologically young mountain ranges of Southern Anatolia.

The two most important epicentres of Palestine lie around Safed and Nablus, both situated in areas of intersection of two sets of structure-lines. At these two epicentres originate the severest earthquakes which have their origin in Palestine itself. Next in importance as epicentres are Ramle-Lydda, er-Reina near Nazareth, and the Jordan Valley especially at Jericho. All these are connected to structure-lines as well, submerged ones in the case of Ramle-Lydda. With reference to the Jericho and Ramle-Lydda areas it should be borne in mind that the deep alluvial fill of the subsoil is bound to increase the effect of earthquakes, and thereby their grade as based on macroseismic observations. The alluvial fill is a locally aggravating factor in the city of Nablus as well. Here normally the quarter on the broad bottom of the valley is shaken much more severely than the steep slopes of Mounts Ebal and Gerizim to the north and south of it.[1]

Sieberg[2] located an additional epicentre of medium frequency in the Deir el

* Concluded from *Israel Exploration Journal*, Vol. 1, No. 4, 1950-51, pp. 223-246.

[1] Cf. *Israel Explor. Journ.*, 1, 1950-51, p. 235.

[2] Sieberg, A.: Untersuchungen über Erdbeben und Bruchschollenbau im östlichen Mittelmeergebiet. *Denkschr. Mediz. Naturwiss. Ges. Jena*, 18, 1932, pp. 159-273.

Balah-Gaza area. This epicentre which was located on the evidence of historic records has not shown any appreciable activity during the current century.

When evaluating the incidence and frequency of earthquakes in Palestine, one must bear well in mind that the present catalogue is based on macroseismic (i. e., non-instrumental) records only, as no instrumental observations are available. Grades are given according to the Mercalli-Cancani scale, as revised by Sieberg:[3] grades 1 and 2 of this scale are microseismic only and are, therefore, not reported by observers except in very exceptional cases. No damage is caused normally by earthquakes of grades 4-6 of this scale; grades 7-8 are strong, generally causing material damage, whilst shocks of grade 9 and above are severe and cause severe damage. A proper evaluation of the catalogue should bear in mind that data are based on damage effected and on personal sensations during occurrence. Their reliability is, therefore, much lower than that of records based on proper instrumental registration. There is no doubt, and little wonder at that, that the record is not homogeneous. Even today quality and completeness of the record depend on availability of voluntary observers and their alertness and intelligence. The number of earthquakes reported from any one place bears no relation to the seismicity of the area, but is rather the result of its historic and geographic importance. This is clearly illustrated by the prominence of Jerusalem in the catalogue, the number of earthquakes reported being out of all proportion to the real intensity of seismic phenomena there. An equally striking proof for the inhomogeneity of the record as a whole is provided by the relatively excessive number of earthquakes reported since 1856. This proves by itself that on the average earthquakes of earlier centuries should be considered as of higher intensity than the more recent ones. When appreciating the earthquake-maximum of the 11th and 12th century (Table 1) it should be borne in mind that, this being the Crusader period, it was particularly well reported. In evening-out the record this maximum should, therefore, probably be given less prominence than is due to it on a numerical basis only. But nevertheless there can be little doubt that this was the most active seismic period in Palestine since 100 B.C. On the other hand the long hiatus in the record of 175 years from 1578 to 1752, during which only two earthquakes are reported,[4] may be not wholly real, but in part due to the incompleteness of the sources during this period of general cultural regression in the country.

[3] Cf. *Israel Explor. Journ.*, 1, 1950-51, p. 224.

[4] 1656—Palestine, general; ca. 1710—Tiberias, reality very doubtful, reported by *one* source only.

Century	Total Number of earthquakes on record *	Major Earthquakes (Grade 9 and above)	Strong Earthquakes (Grades 7-8)	Earthquake Trains	Seismic Sea waves
1st BC	3	1	1	—	—
1st AD	5	—	—	—	—
2nd	1	—	1	—	—
3rd	—	—	—	—	—
4th	6-7	—	1	—	—
5th	4	2	1	—	—
6th	5	2	—	—	1
7th	6	—	3	1	—
8th	7-8	1	2	—	—
9th	6-7	—	2	—	1
10th	—	—	—	—	—
11th	8-9	2	3	1	3
12th	12-15	—	8	3	—
13th	4	2	—	—	—
14th	4	—	1	—	—
15th	4-5	2	2	—	1
16th	6	1	1	1	1
17th	1	—	—	—	—
18th	2-3	2	—	1	1
19th	31-33	1	2	2	—
20th to incl. 1951	50-54	1	2	5	—
Total	165-180	17	30	14	8

* Earthquakes *Trains* are counted as one earthquake only.

Table 1: Statistical Summary of Earthquakes per Century

The record on the whole appears rather satisfactory. During the period of 2050 years under consideration there are only seven gaps exceeding fifty years each, two of them only exceeding 100 years.[5] The catalogue may be considered nearly complete from 1856 onwards, and definitely complete as from 1920.

Although major (Table 2) and strong (Table 3) earthquakes are on the whole evenly spaced over the whole period under consideration, earthquakes generally, and severe ones[6] particularly, do not occur at any steady rate: there are periods

[5] 130-306 (176 years), 894-1002+ (108 years). [6] As the three most destructive earthquakes on record must be considered those of 551, 1033-34, and 1837.

31	B.C.	1033-34	December-January	1546	14.1.
447	A.D.	1068	18.3.	1752	
498	September	1201+		1759	30.10
502	19.8.	1202	20.5.	1837	1.1.
551	7. or 9.7.	1457	(?=1458 12.11.)	1927	11.7.
746	18.1.	1481			

Table 2: Major Earthquakes (Grade 9 and above)

of higher and lower seismic frequency. This is definitely proved by analysis of the most recent part of the catalogue (Table 4). The relatively low incidence at

64	B.C.	756	8.3.	1117	26.6.	1456+	
130	A.D.	808		1151		1577	
306	Winter	856+		1156		1834	23.5.
419		1016		?=1157		1873	29.6.
658	June	1032	6.3.	1170	29.6.	1903	30.3.
659-660		1070	25.2.	1182		1943	10.9.
672		1105	24.12.	1303	8.8.		
?738	16.1.	1114	10.8.	1402+			

Table 3: Strong Earthquakes (Grades 7-8)

the turn of the last century is significant and even more so the low seismic activity during the thirties[7] as compared with the high incidence in both the

1830-9	3	1900-9	4
1840-9	2	1910-9	2
1850-9	3	1920-9	18 if each earthquake-train is counted as 1,
1860-9	6-7		but 39 if each shock is counted separately
1870-9	9-10	1930-9	3
1880-9	2	1940-9	22-26 (28 if counting each shock separately)
1890-9	3		

Table 4: Statistical Summary of Earthquakes for ten-year periods, 1830-1949

twenties (including the major earthquake of 1927) and the forties. For this period the catalogue is considered complete and these oscillations in frequency are, therefore, real.

In order to give average frequency values it seems permissible to state that on the average Palestine is affected by two to five strong earthquakes per century, one or two of which may exceed grade 9. Light to medium tremors are rather

[7] 1931 to 1939 inclusive, one single tremor of grade 3 only.

frequent and on the whole it appears that years during which earthquakes are recorded outnumber those without any earthquake occurrence. The number of light shocks registered in different parts of the country per year varies on the average between about two and six.

It may be safely assumed that nearly every major earthquake is followed by a series of recurrent after-shocks during several weeks or months; but not always does a fore-shock precede a major earthquake.[8] Whereas the more severe *Earthquake Trains* are always after-effects of major earthquakes, occasionally series' of large numbers of light to medium tremors are recorded, not connected with any major seismic activity. This category includes at least the cases of 1921 and 1922, that of 1949, and probably 631 as well (Table 5). It must be assumed that the catalogue is not complete as far as Earthquake Trains are concerned.

631		Shocks continuing for one month.
1033-34	December-January.	Recurrent after-shocks for 40 days.
1114	10.8.	Recurrent after-shocks for 5½ months.
1156		Shocks continuing for one month.
1170	29.6.	Recurrent after-shocks for 3-4 months.
1546	14.1.	Recurrent after-shocks of a major earthquake.
1759	30.10.	Recurrent after-shocks for 1-2 months.
1834	23. or 26.5.	Recurrent after-shocks for ten days.
1837	1.1.	Recurrent after-shocks for over one month.
1921	18.4.-2.5.	Ten shocks, followed by five more tremors until 25.6.
1922	5.5.-9.5.	Four tremors.
1922	21.-23.5.	Three tremors.
1927	11.7.	Recurrent after-shocks for over seven months.
1949	14.-15.4.	Four tremors.

Table 5: Earthquake Trains on record

Before summarising the regional distribution of earthquakes (figs. 1, 2) in Palestine it may be appropriate to re-state some of its basic geomorphological features.* The general direction of the most prominent topographic features of Palestine is north and south. This is the direction of the Coastal Plain, West-Jordan Uplands, Jordan Rift Valley, and Trans-Jordan Highlands, being the four

[8] E. g. in the case of the last major earthquake, 11.7.1927; cf. *Israel Explor. Journ.*, 1, 1950-51, p. 234.

* The essential part of the following chapter has been published in Hebrew in *Eres Israel, Annual Israel Explor. Soc.*, 1, 1951, pp. 173-177.

major morphological units of the country north of Beersheba. This meridional direction originates in the trend of some of the major tectonic elements: the border faults of the rift valley, the western border of Mount Carmel, and others.[9] The Jordan Valley is not a simple rift valley as its border faults are by no means consecutive.[10]

A closer investigation of the geomorphological features of the country north of the Beersheba basin shows at once that these meridional structure lines determine the direction of its major elements only. The finer grain of the country is determined by structures running oblique to the main meridional direction. Most prominent amongst them are those running roughly NNE—SSW (i.e., roughly N30° E), with another system running NW-SE (roughly N40° W). As early as 1931 Picard[11] clearly distinguished between these three tectonic elements, expanding the earlier work of Blanckenhorn.

With reference to geomorphological features the difference between these systems is profound. The forms determined by the meridional and the NNE-structures respectively belong to entirely different morphological systems. As has been stated elsewhere[12] the escarpments[13] formed by the NNE-lines and the broad steps between them are the ruling morphological features of the east flank of Judaea. Traversing this country it is abruptly cut at an acute angle by the 300-600 ms. high precipices of the fault-walls of the rift valley. The age relationship between these systems has been discussed by the geologists. Wellings[14] assumes genetic connection between the border faults of the rift and the NNE anticlinal lines: he dates the original rift faulting as Upper Jurassic, followed by renewed faulting and syngenetic folding (NNE anticlinal structures) in the Upper Pliocene and Pleistocene. Picard[15] attributes the two structures to different systems: he dates the folding of the NNE-lines as Middle

[9] Cf. Blake, G.S.: *Geological Map of Palestine* (North), *1:250.000*. Survey of Palestine, 1939. Shaw, S.H.: *Geological Map of Palestine* (South), *1: 250.000*. Survey of Palestine, 1947.

[10] Wellings' Observations of Dead Sea Structure (with discussion by Bailey Willis). *Bull. Geol. Soc. Amer.*, 49, 1938, pp. 659-667.

[11] Picard, L.: *Geological Researches in the Judean Desert*. Jerusalem, 1931. Ref. pp. 69-74.

[12] Kallner (Amiran), D. H.: Outlines of the Geomorphology of Judea. *Bull. Soc. R.Géogr. d'Egypte*, 21, 1943, pp. 35-49. Cf. Amiran, D.H.K.: Geomorphology of the Central Negev Highlands, *Israel Explor. Journ.*, 1, 1950-51, pp. 107-120, for the continuation of the escarpment lines into the Central Negev Highlands.

[13] Their relative altitude is 150-300 metres.

[14] Wellings, *op. cit.* (supra, n. 10), pp. 659-661.

[15] Picard, L.: *Structure and Evolution of Palestine*. Bull. Geol. Dept. Hebr. Univ. Jerusalem, VI, 2-4. 1943. Espec. pp. 8, 22.

1. Epicentre.
2. Frequent reports.
3. Occasional reports.
4. Single reports.
J. Jerusalem.

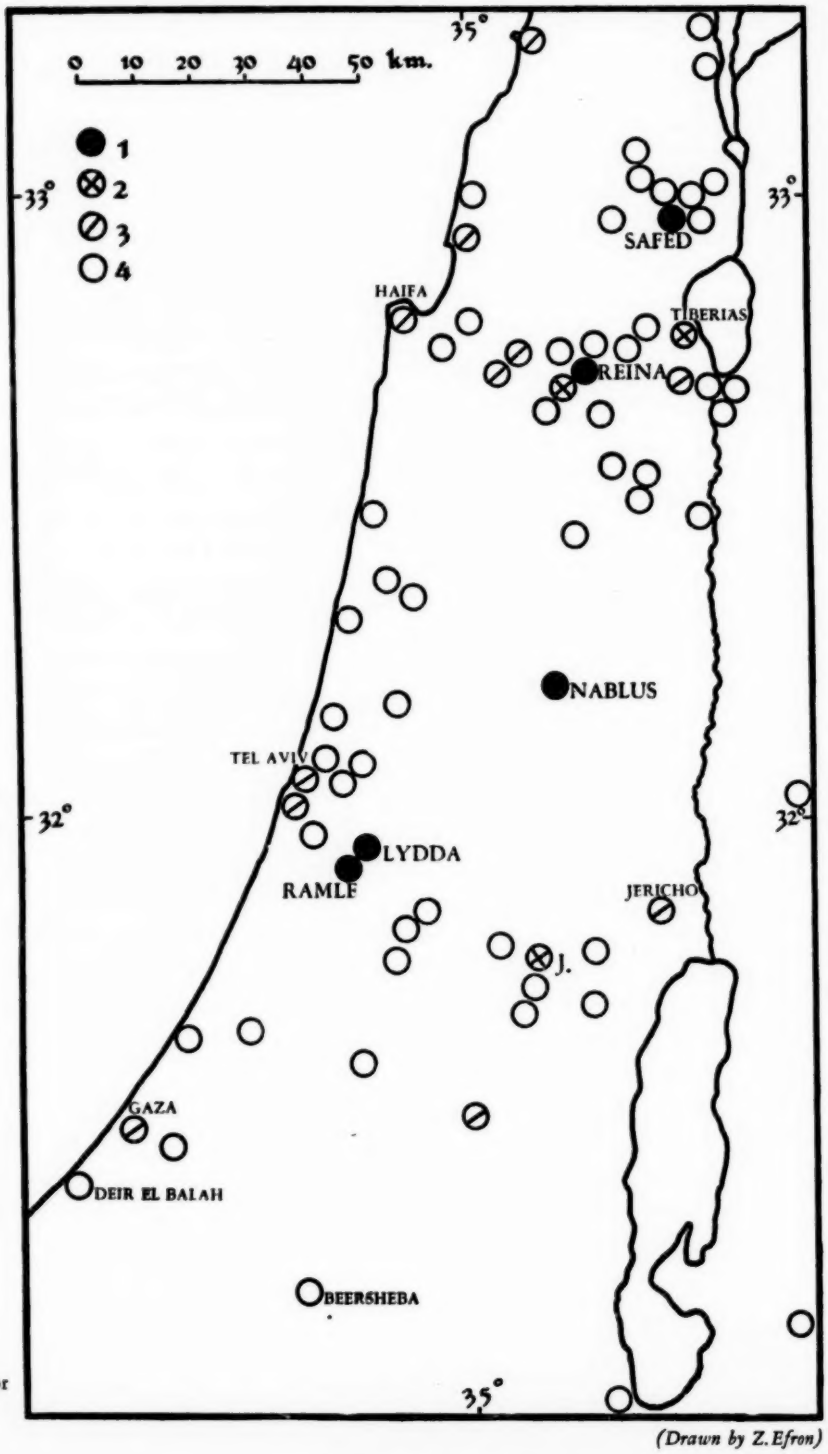
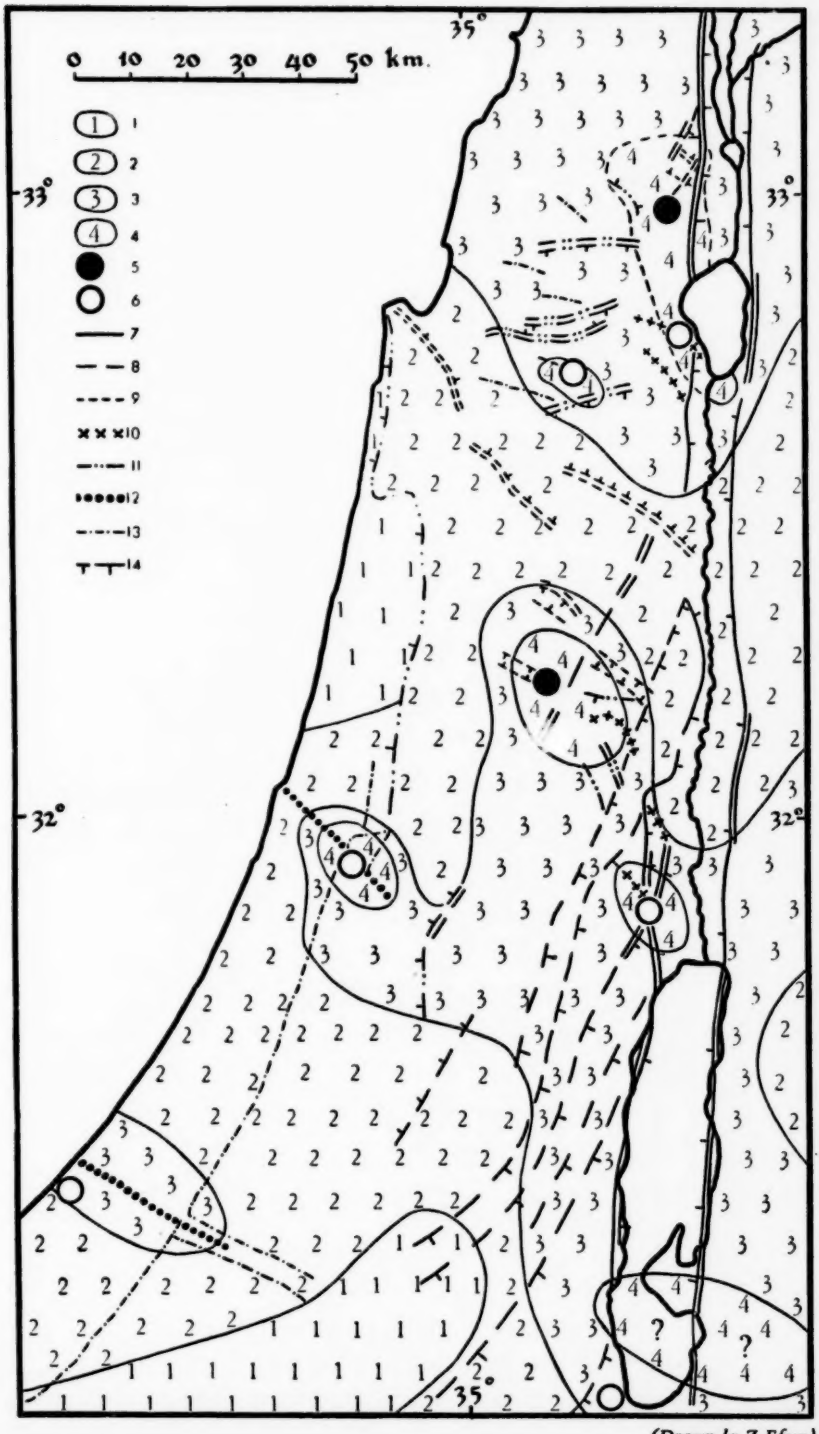


Fig. 1. Location map for earthquake reports.

(Drawn by Z. Efron)



1. Areas experiencing low seismic intensities.
2. Areas experiencing light damage by earthquakes,
3. do., medium damage,
4. do., severe damage.
5. Major epicentre.
6. Minor epicentre.
7-11. Major escarpments and structure-lines:
   7. Rift valley borders,
   8. NNE-SSW escarpment lines.
   9. NW-SE lines.
   10. Crescentic fault-lines.
   11. Other lines.
12. Inferred seismo-tectonic lines.
13. Structure-lines, not forming escarpments.
14. Direction of down-slope.

NOTE: lines are doubled for sections where faults have been proved.

Fig. 2. Seismic areas and elements, according to Blake, Dubertret, Picard, Sieberg, and others.

(Drawn by Z. Efron)

Tertiary and the faulting of the rift borders as later, mainly early Quaternary. Little has been said so far of the age—absolute or relative—of the NW structural element.

Contrary to traditional conception Sieberg in his analysis[16] of earthquake-epicentres in Palestine attributed but secondary importance to the rift valley. According to him the major earthquake-producing elements are active faults and other active structure lines; especially areas where different systems of such lines intersect each other. A short survey of the major epicentres of the country shows the correctness of Sieberg's theory.

Beginning in the north, one of the two major epicentres is situated in Eastern Upper Galilee in the Safed area. Judging from the last part of the earthquake-catalogue, which is the most complete, it may be assumed that at least 50% of the earthquakes recorded in Palestine do affect this epicentre. The tectonic situation of this epicentre is rather complex. The clearest element is the big W-E striking fault-line along which Upper Galilee in the north rises above Lower Galilee in the south. In addition to this three more elements should be involved here: SE-NW striking fault-lines, the most important secondary morphological element of Upper Galilee,[17] NNE-SSW structure lines,[18] and meridional structural elements related to the western border fault of the rift valley.

The other major epicentre, that of Nablus, owes its location to the intersection of a NNE-line which extends through Sahl Mukhnah into Wadi Beidan, upper part of Wadi Fari'a, and towards Tubas, bringing Lower and Upper Cenomanian in the east up against Middle and Upper Eocene in the west; this line is crossed by another one running NW through the plain of Beit Dajan and the valley of Nablus.[19] The aggravating effect of the water-logged alluvial fill of the valley ground at Nablus has already been referred to (p. 48). This was manifest in 1927, and seems equally applicable to the earthquakes of 1201+ and 1546.

Of secondary importance are the epicentres of the Jordan Rift Valley. The

[16] Sieberg, *op. cit.* (supra, n. 2). Ref. pp. 179, 190.

[17] They find their most important morphological expression in this area in the 480 m. high escarpment forming the NE border of the highest mountain of Israel: Mount Meron (Jebel Jermaq), 1208 m. They furthermore form the borders between the three staircase-like plateaux of easternmost Upper Galilee. The importance of this element for the delineation of the Safed epicentre is underlined by the direction of its main axis during the earthquake of 1837: from Safed to Qaddita and el-Jish. (Cf. *Israel Explor. Journ.*, 1, 1950-51, p. 231).

[18] These become escarpment-formers north of Safed in the area of Nabratein, Ramot Naphtali, and Kedesh Naphtali.

[19] Cf. the map of Blake, *op. cit.* (supra, n. 9).

whole area of the rift valley must be considered as of above average earthquake intensity. Outstanding in the records are the surroundings of Jericho and Tiberias. These, being the two largest towns in the Jordan Valley, have of course the best statistical chances for frequent earthquake returns. But there is geological evidence indicating that these relatively frequent records are real and not only the result of statistical accidents. Picard drew attention to the existence of *crescentic faults* at the NW-end of the Dead Sea in the Jericho area.[20] Parallel to this, crescentic faults diverge from the rift valley in a NW-direction in the area of Tiberias.[21] The seismicity of the two areas under reference seems to be proof of the continued recent activity of these crescentic faults. This is borne out by reports from the vicinity of Yavne'el, SSW of Tiberias, which is situated on one of these faults. For recent years, since reports have been forthcoming from there, Yavne'el figures rather prominently in earthquake returns, both for frequency and particularly, for intensity. The intersection of the western border faults of the rift valley with the crescentic faults would then be responsible for the secondary epicentres of Jericho and Tiberias.

If evidence is considered sufficient for the recognition of an additional secondary epicentre in the general area of the southern part of the Dead Sea and the highlands to the east of it—Sieberg[22] marked Sdom on the Dead Sea and Kerak in Trans-Jordan as its centres—the reason for it may be easily understood as well, for here the rift valley intersects with the main axis of the Beersheba basin, the major morphological border in Palestine west of the Jordan.[23]

There remain one major and two secondary epicentres for which an explanation based on the intersection of two sets of structure lines seems not immediately apparent. They are: Ramle-Lydda, Deir el Balah-Gaza, and Reina near Nazareth. The first two of them will be discussed in the following chapter.

It was Sieberg who first suggested[24] that the reason for the severe seismicity of the Ramle-Lydda area is to be sought in the outer (western) fault-border of a sub-

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[20] Picard, *op. cit.* (supra, n. 11), Ref. pp. 72, 99-100.

[21] The possible importance of these crescentic faults for the origin of Lake Tiberias and the delineation of its western shore-line was intimated by the author in: Yam Kinneret we-hofaw (Lake Tiberias and its shores), *Eres Kinnarot* (The Land of Kinnarot), edit. by S. Yeivin & J. W. Hirschberg, Jerusalem, 1950, pp. 11-19, Ref. pp. 13-14.

[22] Sieberg, *op. cit.* (supra, n. 2), map, Pl. I. [23] Cf. Amiran, *op. cit.* (supra, n. 12), Ref. pp. 107-8.

[24] Sieberg. *op. cit.* (supra, n. 2), Ref. pp. 179, 190.

merged echelon of the Judaean Mountains below the coastal plain. This theory has subsequently been proved by geological investigation, including borings,[25] which established the existence here of the *Ramle dislocation*.

Considering the fact that the Ramle-Lydda area is the third of the major epicentres of the country it seems strange that *one* structure line only should account for its high seismic intensity. There is no doubt that this epicentre responds much more strongly to seismic impulses than the surrounding area: this is the more peculiar as the submerged mountain-border extends considerably to the north and south of the Ramle epicentre into areas which generally experience a far lighter earthquake intensity. It seems, therefore, that the submerged mountain-border alone does not satisfactorily account for the high intensity of the Ramle epicentre which affects a certain part of it only. An additional factor may be involved here, the more so as both the Nablus and the Safed epicentres are caused by the intersection of several tectonic lines, and the same applies to the secondary epicentres as well.

Earthquakes generally are good indicators of the recent activity of tectonic lines. While information on earlier earthquakes is not always satisfactory, full data are availably for the last great earthquake in Palestine: that of 11.7.1927 and its after-shocks including the strongest one of 22.2.1928. On the isoseistic maps for these two earthquakes plotted by Sieberg,[26] a NW-striking element is definitely prominent in the direction of the epicentres. In Lower Galilee the epicentre had a distinct NW-SE axis, with the area from Reina near Nazareth to Acre showing grade 7, with the core at Reina of grade 10. Whilst the Nablus epicentre was forming the northern end of an extensive north and south running area which extended with grade 8 southward beyond Bethlehem, the Nablus epicentre itself formed a triangle with the base showing a distinct NW direction again: its core at Nablus had grade 10. A third axis of major seismic intensity extended NW-SE from Jaffa through Ramle to Jerusalem, with the Ramle-Lydda area as one definite epicentre of grade 9.

The earthquake of 22.2.1928 affected two major areas in Palestine. One was the Nablus-Jerusalem area, the other one part of Lower Galilee, extending again in a NW-SE direction with an extensive core of grade 7.

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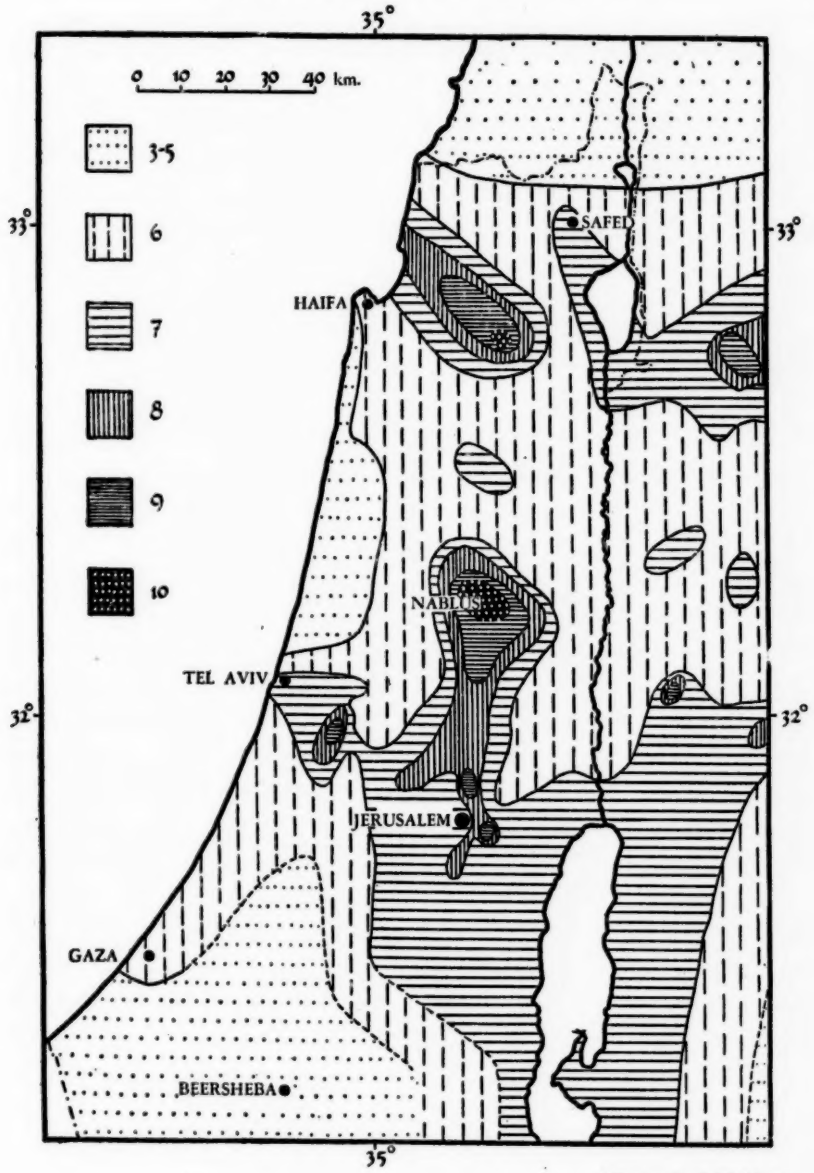
[25] Cf. the map of Blake (supra, n.9) and Picard, L. & Avnimelech, M.: On the Geology of the Central Coastal Plain. *Journ. Palest. Orient. Soc.*, 17, 1937, pp. 255-299. Ref. pp. 280-2 and 290 (boring 13-14, 6) and p. 297 (boring 14-16, 15). [26] Sieberg, *op. cit.* (supra, n. 2), p. 174, fig. 7, for 1927, reproduced here (fig. 3), and p. 191, fig. 15, for 1928.



(Drawn by S. Vitkin)

Fig. 3. Isoseistic map for earthquake of 11.7.1927, according to Sieberg, *Denkschr. Mediz. Naturf. Ges. Jena*, 18, 1932, Taf. II,: seismic grades according to Mercalli-Cancani scale as revised by Sieberg (SM).

Sieberg's analysis of one of the most destructive earthquakes on record from Palestine, that of 1.1.1837,[27] again shows a very prominent NW-axis of the main epicentre extending from the south-end of Lake Tiberias through Safed to Sa'sa in Upper Galilee, with the core of grade 11 around Safed-Gush Halav (Jish).

It thus appears from an analysis of the last major earthquakes that amongst the areas most seriously affected those with a NW-SE axis are prominent. This category includes the Nablus epicentre, situated at the intersection of a NW- with a NNE-line, the main seismic axis of Lower Galilee with the local epicentre at Reina, and possibly the Safed epicentre too, as indicated by the 1837 map. It may be inferred that the NW-SE structure lines, referred to above (p. 53), are amongst the most active recent tectonic elements of Palestine, not inferior to the meridional fault-lines of the rift valley. This deduction agrees well with the fact that the recently active meridional-and NW-lines are fault-lines, whilst the third major structural element, the NNE-lines, are folds;[28] these do not seem to serve as guides to seismic activity.

The question should now be examined whether in addition to the submerged western border of the Judaean Mountains[29] a second structure-line is responsible for the location of the Ramle-Lydda epicentre, thus forming an intersection of two structure-lines as in the other epicentres of the country; and furthermore: whether—this being a major epicentre—this line would have a NW-SE-direction, as these NW-lines are considered to be particularly active. The reality of a NW-SE structure-line, passing through Tel Aviv-Jaffa and the Ramle-Lydda area can indeed be inferred on the following three lines of evidence. (i) Such a line is indicated on the isoseistic map for 11.7.1927 (fig. 3) as mentioned above. (ii) The geological map[30] suggests such a line as expressed by the following features: - the NE-border of the broad recent dune-belt ending south of Jaffa; north from here the dune-belt is both much narrower, and intermittent. The NE-end of the belt of Pleistocene deposits extending through Rehovot and Rishon le-Zion. The broad Ayalon valley, SE of Ramle, the most marked incision in the foothill zone of the Shephela,[31] bringing Turonian and Santonian sediments in the NE up against Eocene deposits in the SW. (iii) The inferred line explains the origin of the coastal bend at Jaffa, an outstanding singularity of the coast of Israel.

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[27] Sieberg, *op. cit.* (supra, n. 2), p. 191, fig. 15.
[28] Cf. Picard, *op. cit.* (supra. n. 15).
[29] The direction of this structure line is NNE—SSW.
[30] Blake, *op. cit.* (supra, n. 9).
[31] Its breadth is 2-3 km., its relative depth below the surrounding hills 100-300 m. Through it, therefore,

Israel has a very straight coastline throughout. This straight coastline is interrupted by two irregularities only — one major and one minor. The major one is the Haifa-Bay formed by the Carmel-promontory, and more particularly by the NE-border of Mount Carmel, a fault-scarp of the NW-SE tectonic system. The minor one is the bend at Jaffa. Whilst the Haifa-Bay brings about a recess of the coast amounting to 10 kilometres, the re-entrant of the coast at Jaffa amounts to 600-800 metres only. The singularity of these two indentations of the coast is further stressed by the nature of marine sediments. The *Fishermen's Chart*[32] shows one kilometre off the coast of Jaffa an area covered by gravel, instead of the usual finer grained sediments: sand or mud. Its width is about one km. This is the only occurrence of gravel off the coast of Israel, except for the Haifa-Bay. In both cases the coarse gravel sediments occur in the exact prolongation of the promontory forming the coastal bend. The difference in dune-development associated with the inferred line has already been mentioned: whilst the width of the dune-belt south of Jaffa reaches nearly seven kilometres, it does not exceed one kilometre to the north of it, except for four small areas.

Whereas no reasonable explanation has been offered so far for the origin of the coastal bend at Jaffa, the assumption of a structure-line extending in a SE-direction from Jaffa would provide a satisfactory explanation, especially in analogy to the much larger phenomenon of the Haifa-Bay which is caused by such a SE-line.

In accepting the reality of this inferred line, the Ramle-Lydda epicentre finds a satisfactory explanation as well. It is situated at the intersection of the inferred Jaffa — Ramle line with the submerged[33] western border-fault of the mountain-block, a line first inferred by Sieberg from an analysis of earthquake-data and subsequently proved by geological investigation. The Ramle-Lydda epicentre is thus of the same category as the other two major epicentres of Palestine, in being situated at the intersection of two tectonic lines. The release of seismic energy originating on these intersections is the immediate reason for the location of the epicentres.

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goes the old Tel Aviv-Jerusalem highway.

[32] Rosenau, E.: *Fishermen's Chart, 1: 100.000.* Govt. of Palestine, Dept. of Agriculture and Fisheries. Fisheries Service. 1938.

[33] For clarity's sake it should be stated again that the western border of the mountains is *submerged* here underneath the quaternary sediments of the Coastal Plain.

As mentioned above (p. 49), Sieberg located a secondary epicentre of medium frequency in the Deir el Balah-Gaza area.[34] He suggested that fault-lines parallel and near to the coast might be responsible for its location. Although records referring to this epicentre are very scanty,[35] its existence is easily understood when considering it in conjunction with the Jaffa-Ramle line. The geological map[36] shows structure-lines extending from Beersheba NW-wards. The continuation of these lines reaches the coast exactly in the Deir el Balah area. This line would explain the Deir el Balah epicentre as situated at the intersection of the Beersheba-Deir el Balah line with an inferred NNE-line, parallel to the coast. Here then is another NW-SE line which may be of considerable recent activity as well. This would fit well with the fact that the Beersheba basin is the major incision into the uplands west of the Jordan. It would be interesting to check on occasion whether a local epicentre, parallel to that of Ramle-Lydda, is located at the intersection of this line with the projected continuation of the NNE-SSW-line of Ramle, i.e., near the confluence of the Gerar and Shemarya valleys (W. Sharia and W. Abu Samara).

If the analogy with the Jaffa-Ramle line provides the key to the understanding of the Deir el Balah epicentre, another analogy must be considered as well. If Sieberg's assumption is correct, that the second intersecting line at Deir el Balah is a series of fault-lines parallel and near to the coast, and if furthermore one may assume that the coastline of Israel in general is conditioned by a system of such NNE-lines, then the possibility should be considered that a minor epicentre may be located at the intersection of the Jaffa-Ramle line with the coast, i.e., in the Tel Aviv-Jaffa area. There is some evidence in the earthquake-catalogue to this effect. If considering definitely reliable reports only, out of 22 earthquakes on record since 1940 ten have been reported from Tel Aviv-Jaffa as well. Even allowing that the largest town of the country has a clear chance for a disproportionately high number of earthquake returns, a return of 45% appears rather excessive. This high figure, then, in conjunction with the reasons stated above may indicate a minor epicentre in the Tel Aviv —Jaffa area.

[34] Sieberg, *op. cit.* (supra, n. 2), Ref. p. 190 & map, Pl. I.

[35] The only definite reference to an earthquake at Deir el Balah made by Sieberg refers to the earthquake of 1033-34 when according to him (p. 193) Deir el Balah *completely succumbed* to the earthquake.

[36] Blake, G. S., Shaw, S. H., Dubertret, L. & Glueck, A.: *Geological Map of Palestine, 1: 500.000.* 1943.

APPENDIX 'B':

AN OFFICIAL REPORT ON THE EARTHQUAKE OF 1837

U. BEN-HORIN

AFTER the earthquake of January 1837, an official report on the damage and number of victims was compiled by Soliman Pasha (Sèves), then Egyptian governor of the eyalet of Sidon, from the detailed reports of the district commissioners. A copy of this report was sent by Ibrahim Pasha to Sami Bey, member of the Khedivial Council, on March 10, 1837, and is now preserved in the Royal Archives of Egypt at Abdine Palace (case 254, doc. 403). An Arabic translation of this report, the original of which was presumably written in Turkish, was published by Asad J. Rustum (*A Calendar of State Papers from the Royal Archives of Egypt relating to the Affairs of Syria,* III, Beirut, 1942, pp. 208-211).

As this seems to be the most authentic and detailed report on this matter, it will be worthwile to translate it in full, with only some minor corrections of place names:

'Copy of the report sent by the müdir of the eyalet and the mütesellim of the town,[37] containing particulars on the loss of life and the destruction of houses and places caused by the severe earthquake which occured by God's resolution on the 24th of Ramadan, 1252,[38] ten minutes before sunset:

District	Subdistrict	Houses damaged	Houses ruined	No. of Persons wounded	do. killed	Remarks
Safed					2158	The houses in Safed and the neighbouring villages were all destroyed and ruined, the number of dead was 2158, comprising native Moslems and Jews and persons under foreign protection. The number of the latter was as follows: Persons under French protection . . . 73 " " British " . . . . 14 " " Tuscanian " . . . . 64 " " Russian & Austrian protection 500 651
Tiberias					922	17 villages in the Tiberias district were destroyed.[39]

[37] of Sidon, i.e., Soliman Pasha.

[38] As the Moslem day begins at sunset and the 24th of Ramadan 1252 began, therefore, on the evening of 1 January, 1837, the first shock of the earthquake really occured at the end of the 23rd Ramadan.

[39] According to Eli Smith (ap. E. Robinson, *Biblical Researches in Palestine,* III, London, 1841, Appendix, p. 131) there were 23 villages at all in the district of Tiberias.

District	Subdistrict	Houses damaged	Houses ruined	No. of Persons wounded	do. killed	Remarks
Nazareth		373	425	13	126	
Acre	Shaghur Jabal Tarshiha	245	563		141	
Athlith Haifa		17	3			One side of the wall of Athlith was damaged.
Tibnin Hunin					614	In this district 49 villages were severely damaged: in some of them one half of the houses were ruined, in some of them two thirds, and in others one third. 5 mills were also ruined.
Shafa'Amr		86	139	4	7	
Jaba'		99	151		23	
Shaqif			199		3	One side of the fortress was ruined.
Nablus					48	One quarter of the town was ruined, one other quarter severely damaged, the rest slightly damaged.
	Bani Sa'b					The village of Kur[40] in the neighbourhood of Bani Sa'b was severely damaged, other villages also suffered considerable damage.
	Sha'rawiya				2	Two houses in the village of 'Attil were ruined, one house in Zeita destroyed, two people were killed and part of the fortress destroyed at Qaqun, and the villages of 'Arraba and 'Ajja were slightly damaged.
	Wadi ash-Sha'ir[41]					The village of Burqa in this district was severely damaged, the other villages were also extensively damaged.
	Jamma'in					Very slight damages occured in the villages of Tell Bisa (?) and Qaryat Jit.
	Mashariq (Nablus)[42]					Only a very slight tremor was felt in this district.
	Bilad Haritha				18	15 villages in this district were ruined, a unknown number of houses damaged.
	Mashariq (al-Jarrar)[42]				21	The Sheikh Muhammad 'Abd al-Hadi wrote in the report which he has submitted that part of the village of Jaba' was ruined, the village of Tubas was severely damaged, and the other villages suffered innumerable damages.
Jerusalem						Only a very slight tremor was felt.

[40] Rustum: Ghaur. [41] Rustum: al-Ghair.

[42] Rustum: Mashariq, without further specification. But as this name is mentioned below for a second time designing there obviously the subdistrict of Mashariq al-Jarrar to which the villages of Jaba' and Tubas belonged, the first one must be Mashariq Nablus.

District	Subdistrict	Houses damaged	Houses ruined	No. of Persons wounded	do. killed	Remarks
Jaffa						A tremor was felt.
Gaza						The tremor was very slight, and there was no damage.
Ramle						A slow tremor was felt.
Sidon		630	201		4	630 houses[43] were ruined, and 577 of them had to be demolished.
Beirut						There was no damage at all in this district.
Latakia						No report was received from the mütesellim of this town, but presumably there was no damage.
Tyre		196	157	19	16	
Tripoli						There was no damage, the tremor being only slight.
Antioch						Only a slow tremor was felt.
Tarsus						Only a slow tremor was felt.
Adana						Many shops in the market 'Great Adana' were destroyed.
Aleppo						Nearly no tremor at all was felt.
Qillis						The tremor was here very slight.
'Aintab						There was nearly no tremor at all.
Damascus						Although the tremor was very strong and caused the tops of some minarets to collapse and one house to be ruined, there was no loss of life.

Note: According to Nicolayson: The Revolt and Earthquake of Jerusalem in 1834. *Quart. Stat. Palest. Explor. Fund*, 1911, pp. 83-89, Ref. pp. 85-86, it appears that the correct date of the earthquake of 1834 was 26 May, and not 23 May, as stated in *Israel Explor. Journ.*, 1, 1950-51, p. 230.

[43] Rustum: villages, which is obviously an error, as this is the number of damaged houses given in the main list. The total number of villages in the district of Sidon was considerably lower.

HEBREW BOOKS AND PAPERS

Books

Schattner, Y.: *Atlas*. Tel Aviv: Yavneh Publishers, 1948. XIV & 40 pp. (77 maps) 28 x 37.5 cm. Printed by George Philip & Son, Ltd., London.

Brawer, M.: *Atlas 'Amami* (Elementary Atlas). Tel Aviv: Yavneh Publishers, (n. d.). 40 pp. (56 maps). 21 x 30.5 cm.

These two atlases are a welcome addition to the educational equipment for geography courses in Israel schools. The atlas of Brawer is intended for elementary schools, that of Schattner for secondary schools. Both atlases in addition to Hebrew name-plates, have been adapted particularly to the requirements of Israel schools by having been centred on the Near East. Some of the maps, therefore, are innovations but seldom to be found in other atlases.

Whereas the Schattner atlas was printed by George Philip & Son, London, it is understood that the Brawer atlas was printed by a Viennese firm and published in 1951. Its reproduction is definitely superior.

The Schattner atlas has a map of Palestine at 1:500,000, whilst Brawer gives the northern part of the country at 1:300,000 and the Negev at 1:600,000.

The relatively large size of the Schattner atlas permits the reproduction of Asia at 1:30 Mill. and of Europe at 1:15 Mill. Detailed maps of the Near Eastern countries (1:2 Mill. to 1:6 Mill.) as well as a series of eleven applied maps of Palestine (climate, geology, soils, phytogeographic regions) are other commendable features. Twenty general distribution maps on geology, climate, vegetation, soils, and population for the world and selected areas open the atlas. Further distribution maps are contained in the sections on the different continents. Introductory notes on projections and notes on the Palestine maps are contained in the preface.

The Brawer atlas presents its maps in relief-manner, giving a plastic and easily comprehensible picture. Particularly valuable are a map of the Levant—Persian Gulf land-bridge, the core of the Near East (1:5 Mill.), and a very attractive map of SW-Asia extending to Burma and the Gobi. The most important facts of physical and human geography are presented in separate maps for the world as a whole (12), and for the different continents (4-6 each).

Cassuto, M. D.: *ha-'Elah 'Anat* (The Goddess Anat). Jerusalem: Bialik Institute, 1951. 110 pp., Pls., Frontisp.

The introduction deals with the discovery of the Ugaritic tablets, and their decipherment; it is followed by a list of the mythological epics and a discussion of their relations with Biblical literature, and of the Ugaritic pantheon: 'El, 'Asherah, Ba'al, Môt and 'Anat. Next comes a short summary of the Ba'al legend as a whole and a discussion of its significance, versions and parallel Biblical traditions. The main part of the book consists of parallel columns, the one containing the transliteration of the Ugaritic text of the 'Anat legend in Hebrew letters and the second a Hebrew vocalised translation, with copious notes. Indices of Biblical passages, Ugaritic words and matters, and a short bibliography complete the work.

Avizur, S. ed.: *Sridê 'Avar* (Remnants of the Past). Tel Aviv, 1951, 120 pp., ill.

A symposium in two parts: part 1 (pp. 7-63) consists of four articles describing various classes of antiquities: flints (M. Stekelis), pottery vessels and their historical value (Ruth Amiran), pottery description and classification by periods (M. Avi-Yonah and Trude Krakauer-Dothan), building remains (J. Kaplan). Part 2 is a series of topographical and historical studies: the first three (by A. Malamat, J. Braslavski and N. Zori) center on Mount Tabor; E. Haltrecht deals with the Plains of Zebulon and Asher, W. A. Fraenkel with the antiquities of Haifa and its vicinity, and S. Avizur with the tells along the Yarkon river.

Papers

ARCHAEOLOGY

General:

Summary notes on new archaeological discoveries in Israel are published in *'Allon Mahleqet ha-'Atiqot* (Bulletin of the Department of Antiquities): No. 1, 1949, pp. 6-9, 22-23, Pl. I; No. 2, 1950, pp. 9-17, 24-25, Pls. I-IV; No. 3, 1951, pp. 6-16, 27-49, Pls. I-VIII.

Prehistory:

A Lower Palaeolithic site (Upper Acheulean and La Micoque) with fragments of elephant molars, found at 'Evron near Nahariya, is reported by M. Stekelis in *'Allon*, 2, 1950, pp. 29-30.

Two new figurines from Sha'ar ha-Golan, discovered during the investigation of remains of the Yarmukian culture, are published by M. Stekelis in *Bull. Jew. Palest. Explor. Soc.*, 15, 1949, pp. 67-69, Pl. I (Cf. *Israel Explor. Journ.*, 1, 1950-51, pp. 1-19).

Philistine to Persian Periods:

Provisional reports of excavations at Tell Qasîle (Cf. *Israel Explor. Journ.*, 1, 1950-51, Nos. 2-4) were published by B. Maisler in *Bull. Jew. Palest. Explor. Soc.*, 15, 1949, pp. 8-18 and *'Allon*, 2, 1950, pp. 27-29.

Helenistic to Byzantine Periods:

J. Kaplan describes the remains of Hellenistic fortifications found at Tel Aviv, and rock-cut tombs containing ossuaries, found N of the Yarkon River. He identifies the remains of the fortifications with the wall constructed by Alexander Jannaeus from Antipatris to the sea. (Josephus, *Ant.*, XIII,15, 3; *BJ* I,4,7). The tombs are probably of the first century B.C. (*Bull. Jew. Palest. Explor. Soc.*, 15, 1950, pp. 71-74; *Bull. Isr. Explor. Soc.*,[1] 16, 1951, pp. 17-23).

Trial soundings at 'Engeddi in 1949 are reported by B. Maisler. Tell el-Jurn was found to be a natural hill with a few Middle Iron sherds and a Roman fort on its top. Herodian tombs and Roman pools and aqueducts were studied. (*Bull. Jew. Palest. Explor. Soc.*, 15, 1949, pp. 25-28; *'Allon* 2, 1950, p. 30.)

A Samaritan synagogue was excavated by E. L. Sukenik at She'albim (Salbit). Its mosaic pavement contains an inscription in Samaritan script and two seven-branched candle sticks. The building measures 15.5 by 8 m. and is oriented on Mount Gerizim. This mountain is also supposed to be represented on the mosaic by a

[1] Formerly: Jewish Palestine Exploration Society

stepped design between the candlesticks. The original building of the synagogue is attributed to the fourth century A. D. with traces of a later restoration. (*'Allon*, 2, 1950, pp. 31-32.)

Ruth Amiran discusses the ancient quarries of Mount Carmel and its coast, viz. Kh. Shellale, the quarries opposite Dor, Kafr Lam and the Kibbus Barqay opposite the issue of Wadi 'Ara. The date of the quarries appears to be Hellenistic, Herodian and Roman; the re-use of the quarry walls for tomb-facades provides a convenient terminus *ante quem*. (*'Allon*, 3, 1951, pp. 47-49, Pl. VIII, 1-5.)

EPIGRAPHY AND PALAEOGRAPHY:

S. Yeivin assigns the Leviticus fragments of the Dead Sea find to the late second or early first century B.C., considering them to be of Samaritan origin; B. Kanael regards them as post-Maccabean. (*Bull. Jew. Palest. Explor. Soc.*, 15, 1950, pp. 106-107; *Bull. Isr. Explor. Soc.*, 16, 1951, pp. 46-52.)

A Christian tombstone inscribed in Greek, found at Beeroth Yis-haq, commemorating the priest and archimandrite Alexander (who died on 24 February, 505) and a Jewish epitaph from Caesarea are published by M. Schwabe. (*Bull. Jew. Palest. Explor. Soc.*, 15, 1950, pp. 103-106; *Bull. Isr. Explor. Soc.*, 16, 1951, pp. 53-57; cf. *Isr. Explor. Journ.*, 1, 1950-51, pp. 49-53.)

Ch. B. Rosen notes a popular spelling τὸγ κίονα in the Caphernaum synagogue, corrected by the mason to the classical τὸν. (*Bull. Isr. Explor. Soc.*, 16, 1951, pp. 58-59.)

Ruth Amiran and I. Ben Zevie published independently a new Judaeo-Aramaic inscription found at 'Alma and related to the synagogue there. It commemorates a benefactor from Tiberias who donated a lintel. (*'Allon*, 2, 1950, pp. 25-26; *Bull. Jew. Palest. Explor. Soc.*, 15, 1950, pp. 75-77.)

NUMISMATICS:

A weight inscribed 'Sheqel' in old Hebrew script is published by A. Reifenberg in *Bull. Jew. Palest. Explor. Soc.*, 15, 1950, p. 70, Pl. II. In the same issue H. Hamburger attempts a topographical history of Caesarea based on coin finds in the city area (pp. 78-82).

An unknown coin of Agrippa II, dated A. D. 81, was published by the late Stella Ben-Dor in *Bull. Isr. Explor. Soc.*, 16, 1951, p. 60, Pl. IV.

TOPOGRAPHY:

The historical topography of Jerusalem is reviewed by J. Press who tries to show that the western hill was already settled in the times of the monarchy. (*Jerusalem*, 1, 1948, pp. 129-134.)

B. Maisler identifies the YRD of Thutmosis III, the Yu-ur-za of the Amarna letters, with Tell Jemme, connecting it with the 'Jordan' of Josephus (*BJ*, II, 3,5) and the ΩΡΔΑ of the Madeba map. (*Bull. Isr. Explor. Soc.*, 16, 1951, pp. 38-41.)

J. Kaplan identifies Kh. Habra with the Kefar Hebrona of a Late Byzantine piyut. (*Bull. Jew. Palest. Explor. Soc.*, 14, 1949, pp. 91-92.)

HISTORY:

M. Avi-Yonah places near the NW corner of the city wall the breach through which the Persians entered Jerusalem in 614. (*Jerusalem*, 2, 1949, pp. 228-230).

J. W. Hirschberg, in discussing the status of Jerusalem in the Moslem world, concludes that the importance of Jerusalem is purely religious and even from that point of view it is ambivalent. Some Moslem traditions consider Jerusalem a sacred city, occasionally even a substitute for Mecca as a place of pilgrimage. On the other hand, one may be a devout Moslem without any religious attitude at all towards Jerusalem. (*Jerusalem*, 2, 1949, pp. 55-60.)

A series of letters from Jerusalem, written in the years 1453-1525 and preserved in Ms. in the Laurentiana Library, Florence, and in the Parma Library, are critically examined by J. Prawer. (*Jerusalem*, 1, 1948, pp. 139-159.)

ORIENTALIA:

Ha-Mizrah he-Hadash (The New East), the Quarterly of the Israel Oriental Society, brings *i. a.* a paper by S.Ya'ari on the Railroads in Syria and Iraq (1, 1949, pp. 34-40, map): the development of the railway network in both countries and plans for future development are discussed.—Vol. 2, 1951, pp. 279-282, carries an informative survey of present-day Kuwait by G. Tadmor, dealing with recent political and economic developments of this small Sheikhdom at the head of the Persian Gulf, which is of particular interest at present on account of its exceedingly rich oil resources.—D. Ariel deals with 'The Kurds in the Middle East' (Vol. 2, 1951, pp. 301-312), a people with an estimated number of above 3 millions, who have the bad fortune to inhabit an area split up between Turkey, Iraq, Persia and Syria. The attitude of the various countries towards their Kurdish minorities is discussed, and a htorough analysis of Kurdish communities and political movements is presented.

CLIMATE:

D. Ashbel compares the heavy snowfall of the winter 1949-50 (cf. *Isr. Explor. Journ.*, 1, 1950-51, pp. 122-3) with previous snowfalls in the country. Mention is made of snowfalls in January, 1942, February, 1932, as well as the winters of 1928-29, 1927-28, 1926-27, 1919-20 and earlier occurrences back to 1843-44, and certain general conclusions about areas affected, extreme dates of occurrence, and depth of snow-cover are presented. (*Bull. Jew. Palest. Explor. Soc.*, 15, 1950, pp. 113-115.)

GEOGRAPHY:

The Western Border of the Hebron Mountains, a bold monoclinal escarpment, is the subject of a paper by D.H.K. Amiran. This escarpment shows for long stretches isoclinal features, i. e., conformity of the dip of the strata and the inclination of the slope. The morphological relation between the various areas adjacent to the escarpment is discussed. The pattern of villages in this area clearly shows the influence of the mountain border: topography, springs, economic, and security conditions being the governing factors. (*Bull. Jew. Palest. Explor. Soc.*, 14, 1949, pp. 112-118, map.)

GEOLOGY:

Magmatic phenomena in the Makhtesh Ramon, the largest of the *Makhteshim* in the Negev, are the subject of a paper by J. Bentor. The Makhtesh exposes a mesozoic sequence of strata up to 1500 ms. thick,

beginning with Triassic. This sedimentary series contains a variety of magmatic features: stock, laccolith, sills, dikes, and an extrusive basalt sheet are amongst those analysed in detail. The succession and position of these magmatic rocks is described. Most, and probably all, of these rocks are dated to the Jurassic Period. Two geological sketch-maps, three cross-sections, and three photos illustrate the paper. (*Bull. Isr. Explor. Soc.*, 16, 1951, pp. 3-16, Pls. I, II.)

REVIEWS

Reifenberg, Adolf: *Ancient Hebrew Arts.* New York; Schocken Books, 1950. 171 p. 202 ills., 1 map.

Bibliographically, this is a revised translation of the author's 'Denkmäler der jüdischen Antike', published in 1937. From every other point of view it is a new book. The original has been entirely recast, the text having been considerably reduced, the pictorial material enlarged by more than a third, and many photographs replaced by better ones. The arrangement of the present edition is strictly chronological with Jewish history divided into six main periods, starting with that of the Kings and ending with that of the Romans. Each chapter is written around a series of objects, well illustrated and with descriptions which are short and to the point. The inscriptions are always noted, being reproduced both in their original languages and in translation. In each case the present whereabouts of the objects are recorded so that an attentive student can examine anew the original, or perhaps special photographs of interesting details of it. Following the text are five tables on the chronology of Palestinian archaeology, references to the Bible, a list of motifs in ancient Hebrew art, a list of archaeological sites on both sides of the Jordan, with a map showing their location, and an index of relevant museums and collections.

The book does not claim to be a corpus of Jewish monuments; rather an introduction to a phase of art. Greater emphasis, therefore, has been placed on architecture, including wall decoration and wall carving, and on coins, including coin-like objects. These are subjects in which the author has had a long and special interest, and which he is, therefore, well qualified to handle. Reifenberg has selected his objects from the point of view of quality rather than attempting to present unpublished material. In endeavouring to show the objects to their best advantage, he has included many illustrations of well known monuments taken from a new angle or in a different light. Some of the photographs have been enlarged to as much as five times their original size in order to bring out details, which would ordinarily escape notice.

Palestinian archaeology is indebted to Professor Reifenberg for more than thirty books and articles dealing with the arts and crafts of Israel, starting with his first bird's eye view of the subject in 1925, up to the second edition of his monograph on Jewish coins, and his comprehen-

sive little book on ancient Hebrew seals. Some of them were written for dry-as-dust archaeologists, others for a large public, in whom Professor Reifenberg tried to instill some of that enthusiasm which moved him—a soil scientist by profession—to devote long periods of serious work to the archaeology of this country. In the course of his researches, he has introduced many ancient monuments to those interested in the material culture of the Jewish people. It is, however, not so much the number of new buildings or objects he has discovered or described for the first time, as his flair for quality and his judgment in appreciating artistic values which have secured for him a place among the connoisseurs of ancient Jewish art.

L. A. MAYER

Schattner, Y.: *Mapat Eres-Yisrael ve-toldoteha* (The map of Palestine and its history). Jerusalem: Bialik Institute, 1951. 204 pp., 24 figs., 16 Pls.

The book under review is a valuable contribution to the literature both on Palestinology and on the history of cartography. Although there are many papers on individual maps of Palestine and on those of certain periods—by Roehricht and many other scholars—this is the only comprehensive treatment of the development of the map of the Holy Land. Schattner gives a considered and well-balanced presentation of his subject, beginning with the mosaic map of Madeba and the Tabula Peutingeriana. Detailed treatment is given to mediaeval cartography, especially as maps of Palestine form the majority of all mediaeval maps. Many technical aspects and improvements of mediaeval cartography, therefore, found their first application in maps of the Holy Land. *E. g.* Jacobus Ziegler in the map accompanying his *Terrae Sanctae quam Palaestinam nominant descriptio* (1536) was the first to show magnetic declination on maps. Mappae mundi, Portolan charts, the revival of Ptolemaeus, are the subject of different chapters, followed by others on the period of Atlases and cosmographiae. Special attention is given to the development of the cartographic picture of the Holy Land in the Atlas period, culminating in the works of the French school. It was the French cartographers who brought a critical and scientific approach to the compilation of maps of the Holy Land and who did away with such time-honoured mistakes as the Jor and the Dan (the two legendary headwaters of the Jordan), or the Lebanon extending in a West-East direction, thus forming the northern border of Galilee. At this time also the brook Kishon was first properly shown on maps: hitherto it had caused much confusion, some maps showing it as flowing from Lake Tiberias (212 m. below sea-level!) into the Mediterranean, and others inserting non-existent lakes in its course.

The concluding chapter deals with the last 200 years, beginning with the map of Jacotin, surveyor-in-chief of Napoleon's army in Egypt. The maps accompanying the works of the explorers of the 19th century from Burckhardt to Anderson—many of which are reproduced in the book—become more and more accurate. This leads to the first modern and large-scale survey of the country conducted by Conder and Kitchener on behalf of the Palestine Exploration Fund in 1871-77.

It is but natural that a reviewer does not subscribe to all the opinions of the author. Not everyone will share the author's enthusiasm for the French method of printing contour lines for negative altitudes (i. e., those for areas situated below sea-level) in a different colour. This method creates the impression of a line of discontinuity or an escarpment which does not exist in nature. It might be worth while, however, to try to achieve a better plastic effect of maps by printing contour lines in different colours of an ascending scale, similar to the conventional scale for altitude layer-tints.

Not every cartographer will also agree that a topographic map should show isobathic lines to indicate the surface configuration of the adjacent ocean-bottom. These contours introduce into the map an element of unevenness which contradicts the uniform appearance of the sea-level. But the majority who share the author's opinion that isobaths should be printed on topographic maps will strongly protest against his suggestion that they should be shown on the continental shelf only, for they will maintain that the isobaths must be shown right to the margins of the sheet.

Schattner mentions various methods of representing relative relief, *i.e.*, of indicating the intensity of altitude differences in a given area. After referring to the method of representing maximum relative relief he unfortunately makes reference to *average* relative relief as well; O. Lehmann many years ago classified this as an 'UNding,' fitting the cartographic representation of a meaningless abstraction which defeats any attempt at exact definition.

But all these are minor points which should not detract from the value of a very useful and well-balanced contribution to the geographic literature on Palestine. One regrets the more that a wholly unadequate two pages are added on maps from World War I and later. This chapter is not only too short but it differs markedly from the well-balanced and sober judgment displayed throughout the book.

The book is well repoduced, with many black-white reproductions of maps; it is understood that it will be supplemented by a facsimile atlas in colour to be published soon. There are not more than the usual number of misprints, — except for the bibliographical list which needs a thorough checking. The addition of an index to the second edition would make it more valuable still as a reference work.

D. H. K. AMIRAN

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